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# DYNA SOAR PROGRAM PLANNING REPORT (STEP I). SUMMARY, VOLUME I

Boeing Company
Seattle, Washington

26 August 1960

Best Available Copy

DYNA SOAR PROGRAM PLANNING REPORT
(STEP I)

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SUMMARY - VOLUME I

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Prepared By

Boeing Airplane Company

Approved By ______ 8-26-60
G. H. Stoner (Date)
Program Manager

Prepared For

Dyna Soar Weapon System Project Office
Wright-Patterson AFB, Dayton, Ohio

Contract No. AF33(600)-41517



60LMSD-4213

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*This entire document has been revised for release on 26 August 1960. All pages, including charts, are new and have never been released prior to this date. Destroy previous issue of this ~~document released on 11 April 1960.~~

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| g | Headquarters NASA, 1512 H. Street, N.W. Attn: Mr. A.J.Evans Washington 25, D.C. |
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| j | Lewis Flight Propulsion Laboratory, 21000 Broompark Road, Attn: Mr. E. Jonash, Cleveland 35, Ohio. |
| k | NASA High Speed Flight Research Station, Attn: Mr. Paul Bikle, P.O. Box 273, Edwards AFB, California. |
| l | Air Force Flight Test Center, Attn: FTGS, Edwards AFB, Calif. |
| m | Air Force Missile Test Center, Attn: MTLPS, Patrick AFB, Florida. |
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| t | Chief, WPNS Division, Directorate of Plans & Requirements Hq, Air Defense Command, Colorado Springs, Colorado. |
| u | AMC Aeronautical Systems Center, Attn: LMSD, Wright-Patterson AFB, Ohio. |
| v | Oklahoma Air Material Area, Attn: OCNM, Tinker Air Force Base, Oklahoma City, Oklahoma. |
| w | Headquarters, Wright Air Development Division, Attn: WWMFS Wright-Patterson AFB, Ohio. |
| aa | Headquarters ATC, Attn: ATTWS, Randolph Air Force Base, Texas. |
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| cc | AMC Aeronautical Systems Center, Attn: LMECC, Wright-Patterson Air Force Base, Ohio. |
| ff | WADD - FTO, Patrick AFB, Florida. |
| gg | AMC Aeronautical Systems Center, Attn: LMBMF-2, Wright-Patterson Air Force Base, Ohio. |

# FOREWORD

**THIS INITIAL PROGRAM PLAN, WHILE INCOMPLETE, REFLECTS THE COORDINATION ACCOMPLISHED WITH ALL PARTICIPANTS OF THE DYNA SOAR PROGRAM BY THE SYSTEM CONTRACTOR PRIOR TO DATE OF ISSUE. INSOFAR AS THE BOEING PORTION OF THE EFFORT IS CONCERNED IT REFLECTS THE PROGRAM THAT THE SYSTEM CONTRACTOR IS PROPOSING TO THE AIR FORCE FOR CONTRACT DEFINITIZATION OF THE FIRST STEP I CONTRACT INCREMENT, APRIL 27, 1960, THROUGH JUNE 30, 1961.**

**THIS PLAN IS NOT APPROVED BY THE DYNA SOAR WSPO AND IS FOR INFORMATION AND COORDINATION ONLY.**

**THE SYSTEM CONTRACTOR IS PROCEEDING IN ACCORDANCE WITH THIS PLAN.**

The Dyna Soar program plan is made up of a series of individual plans which are summarized in a top document. This top document consists of two volumes.

Volume I provides a summary of the program in its entirety. It contains a description of the program organization structure, an outline of the system elements, the proposed approach to accomplishing the program objectives, the ground rules, master phasing, and summaries of the detailed plans which compose the remainder of the program plan.

Volume II consists of a section for each of the level three sub-area elements. Each section contains a description of the program approach and detailed phasing charts. These charts list the program activities at the component or task level and indicate the timing of significant events. The submittal dates for the reports listed in attachment #3 have not been scheduled in the detail phasing charts. When the contract definitization is complete the schedule dates for these items will be included in the charts.

The individual detailed plans are bound separately and are identified as subsidiary documents of the top or master document. These individual documents cover in detail areas of special interest of the Dyna Soar Program. The list of the documents that make up the program plan are shown below.

| Boeing Airplane Company Document Number | Document Title |
|---|---|
| D2-5697 | Program Planning Report Dyna Soar (Step I) |
| | Volume I - Program Summary |
| | Volume II - Program Summary |
| D2-5697-1 | Program Cost Estimates |
| D2-5697-2 | Facilities Plan |
| D2-5697-3 | Make-or-Buy Plan |
| D2-5697-4 | Reliability Program Plan |
| D2-5697-5 | Maintainability Plan |
| D2-5697-6 | Manufacturing Plan |
| D2-5697-7 | Manufacturing Methods Development Plan |
| D2-5697-8 | Tooling Plan |
| D2-5697-9 | Contractor's Logistics Support Plan |
| D2-5697-10 | Ground Support Equipment Plan |
| D2-5697-11 | Government Furnished Equipment Plan |
| D2-5697-12 | Bailment Property |
| D2-5697-13 | Subcontract Plan |
| D2-5697-14 | System Development Test Plan |
| D2-5697-15 | Manufacturing Facilities Plan |
| D2-5697-16 | Design Development Test Plan |
| D2-5697-17 | Air Crew Training Plan |
| D2-5697-18 | Fire Protection & Safety Program Plan |
| D2-5697-19 | Human Factors Program Plan |
| D2-5697-20 | Government Furnished Property Plan |

## TABLE OF CONTENTS

## INTRODUCTION

This document has been prepared by the System Contractor, under Letter Contract AF 33(600)-41517, and in accordance with the requirements set forth in paragraph C.4.4 of the Dyna Soar Statement of Work identified as Statement of Work, System 620A, Dyna Soar (Step I), ID 60 LMSD-4196 (Boeing Document D2-7438), dated 6 August 1960. The Document is designed to provide a single point of reference for all planning activities of the Dyna Soar (Step I) Program and contains all data available to the System Contractor at the time of publication. Since the Dyna Soar Program as outlined in the above mentioned statement of work, is a research and development program, more complete information will be added to this document as it becomes available.

The system development test schedule has been revised to be compatible with the Air Force System Development Test Plan. The first air launch test is scheduled for July, 1963, and the first ground launch is scheduled for November, 1963. The System Contractor's program plan has been developed in accordance with this revision. The schedules contained in The Martin Company and Aerojet-General program plans were developed prior to firming up of this schedule and are not compatible with the current Systems Development Test Schedule. As a result, revised booster schedules are proposed by the System Contractor to support the current flight dates but have not been coordinated with the Associate Contractors. This coordination must be accomplished to obtain a compatible program schedule.

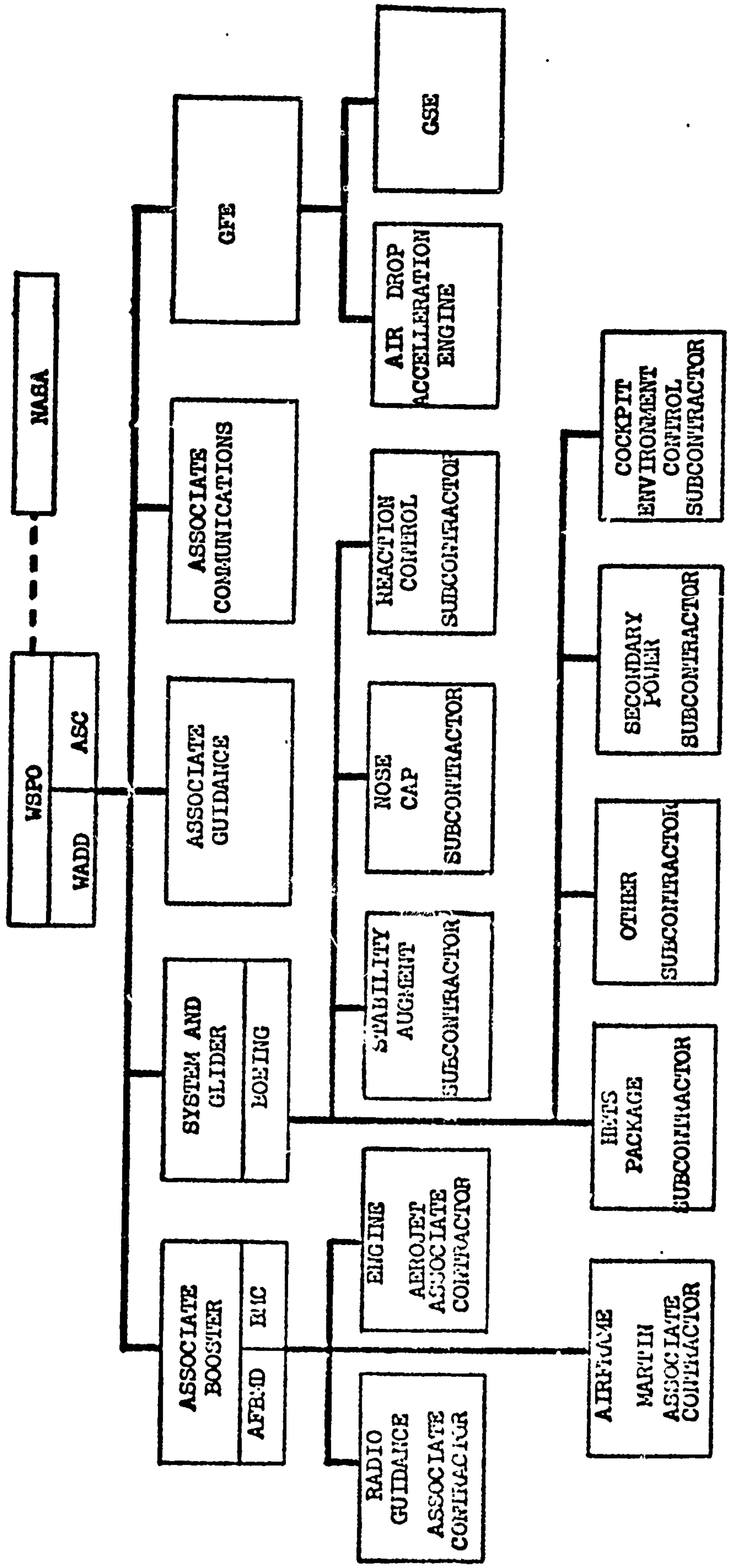
The program schedules included in this document follow the program elements defined herein and have been developed on a format readily adaptable to the PEP System. The timing of the events and activities scheduled is based on the development and design effort accomplished as of this date and may require adjustments as the program progresses. It also should be noted that all program schedules contained in this document are based upon Work Statement ID 60 LMSD-4196 (Boeing Document D2-7438) dated 6 August 1960 under Letter Contract AF 33(600)-41517 which has not been definitized. Consequently, additional changes to the schedules may be required upon completion of contract definitization.

In order to assure that all recipients of the program plan will at all times possess an up-to-date copy of the program plan, a revision procedure has been established. This procedure requires that the revisions will be transmitted, after approval by the WSPO, to all recipients with a revision summary sheet indicating a revision, an addition or deletion to the plan. The summary sheet will also reflect the date of revision and the page number that has been revised. An example of this summary sheet is contained in Volume II of the Program Plan under the Planning and Reporting Section.

DYNA SOAR PROGRAM ORGANIZATION

The Dyna Soar Program is being conducted as a joint Air Force/NASA project. Step I is a Research and Development Effort. Technical Control of the project rests with the Air Force acting with the advice and assistance of the NASA. Management of the project is accomplished by an Air Force System Project Office which includes liaison representation of the NASA. Design and construction of the system is being conducted through negotiated contracts with the Boeing Airplane Company as System Contractor and Martin, Aerojet and others as associate contractors. Certain "off-the-shelf" equipment will be supplied GFE in the normal manner. Flight testing of the vehicle and related equipments will be accomplished under the overall control of a joint USAF/NASA and contractors committee.

Direction, coordination, and reporting relationships of the Air Force, NASA, and contractor agencies which are participating in the program are depicted schematically and described in detail below.




DYNA SOAR STEP I PROGRAM MANAGEMENT

## DYNA SOAR PROGRAM MANAGEMENT

### General

Dyna Soar program management is assigned to the WSPO located at Wright-Patterson Air Force Base, Ohio. It is comprised of ARDC (WADD) and AMC (ASC) personnel, and will function in accordance with AFR 20-10. Technical liaison required to conduct the joint USAF/NASA Program is provided by NASA representation. Fundamentally, this management responsibility involves the identification and definition of the tasks that are required to satisfy the total program objectives, the assignment of the tasks to industry and to appropriate government agencies, the time phasing calculation of results achieved, determination of remedial courses of action, as appropriate, and subsequent decisions and direction as the program progresses.

ARDC and AMC have accepted as a principle that the experience and knowledge available at AFMD/BMC from the ballistic missile program should be effectively and efficiently used in support of the Dyna Soar Booster Program; therefore, it has been determined that the Dyna Soar Booster will be developed and procured by AFMDC/BMC in accordance with requirements furnished by the WSPO.

Technical competency of the WSPO is assured through the merger of the systems management and systems engineering capability inherent in the WADD complex. This merger augments the WSPO with strong in-house technical support and provides a greatly increased degree of program control by the Air Force. In addition, such functions as system analysis and technical integration and guidance for design and qualification of the glider, glider subsystems and support systems are performed by the WSPO. Also, the WSPO will be responsible for procurement, production, supply, maintenance, and total program integration for timely delivery and support, and personnel technically proficient in each of these areas are assigned to the WSPO.

Supporting Agencies

OCAMA is assigned as Logistics Support Manager (LSM) and will be responsible for the supply of common items required to support the program. During the early phases of the program, logistics support will be primarily a contracted effort however, maximum utilization of common equipment and existing government facilities has been accepted as a principle in the logistical support of this program.

AFBMD will be a technical consultant to the WSPO on all booster matters and participate fully in reviews, coordination meetings, etc., as required. AFBMD/BMC will be represented on the WSPO System Test Force to insure the inclusion of booster requirements in all planning; they will support System Testing by supplying a booster launch team, responsible to the test force director.

The Air Force Flight Test Center will discharge the normally assigned responsibilities in conducting the air launched tests of the glider. In addition, AFFTC will be responsible for the planning of the System Development Tests. To discharge this responsibility AFFTC will chair the System Development Test Planning Group which will have representatives from all participating ARDC and AMC agencies, NASA and contractors. (The particular location of the assignment of this responsibility is subject to change.)

The Air Force Missile Test Center will support the test activities. In addition, AFMTC will chair the System Development Test Range Group which will have the responsibility for planning, programming, initiating and monitoring the integrated test range support for the entire test program, including that on the AMR. Representation on the System Development Test Range Group will include all participating ARDC and AMC agencies, NASA (Flight Research Center) and PMR or similar agencies when such are assigned roles in the world wide range. It will also include booster and glider contractors and subcontractors as appropriate.

Other ARDC Centers will be called upon as required for technical advice and for support in their normal areas of responsibility. Use of wind tunnels, tracks, etc., will be required during design and Category I test activities.

NASA Langley Research Center.

The National Aeronautics and Space Administration (Langley Research Center) will chair the System Development Test Instrumentation Group, with representatives from all participating ARDC agencies and contractors. This group will determine the instrumentation to be placed in the vehicle for each test, and will request necessary procurement actions for the instrumentation, as well as provide technical direction for the design and development of the new types of instrumentation. It will also be responsible for monitoring the actual installation of the instrumentation into test articles.

NOTE. Responsibilities and participation depicted above represent agreements and organizational structures presently in effect. Changes to detailed assignments stemming from NASA desires or ARDC/AMC organizational functional changes will be reflected in changes to this plan.

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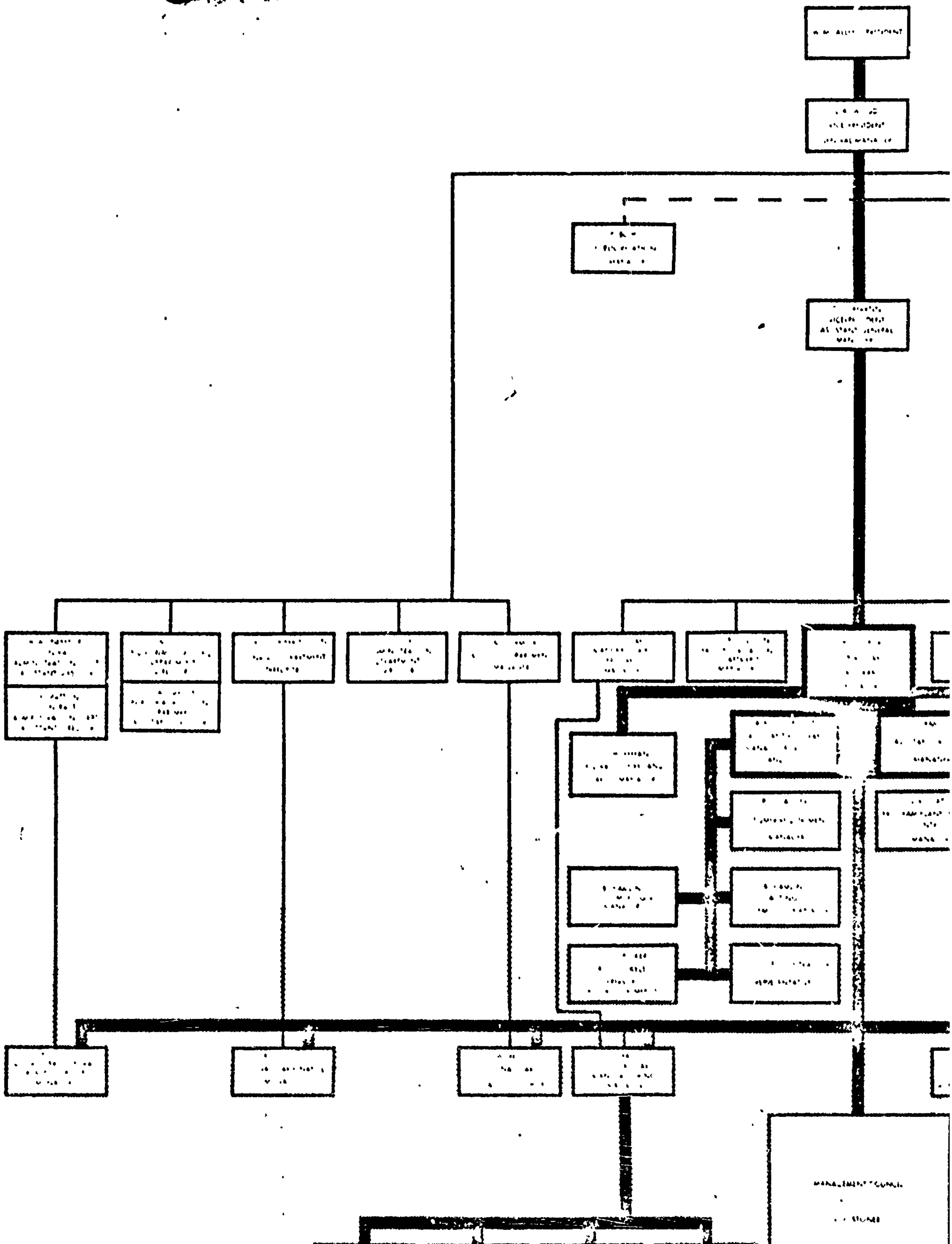

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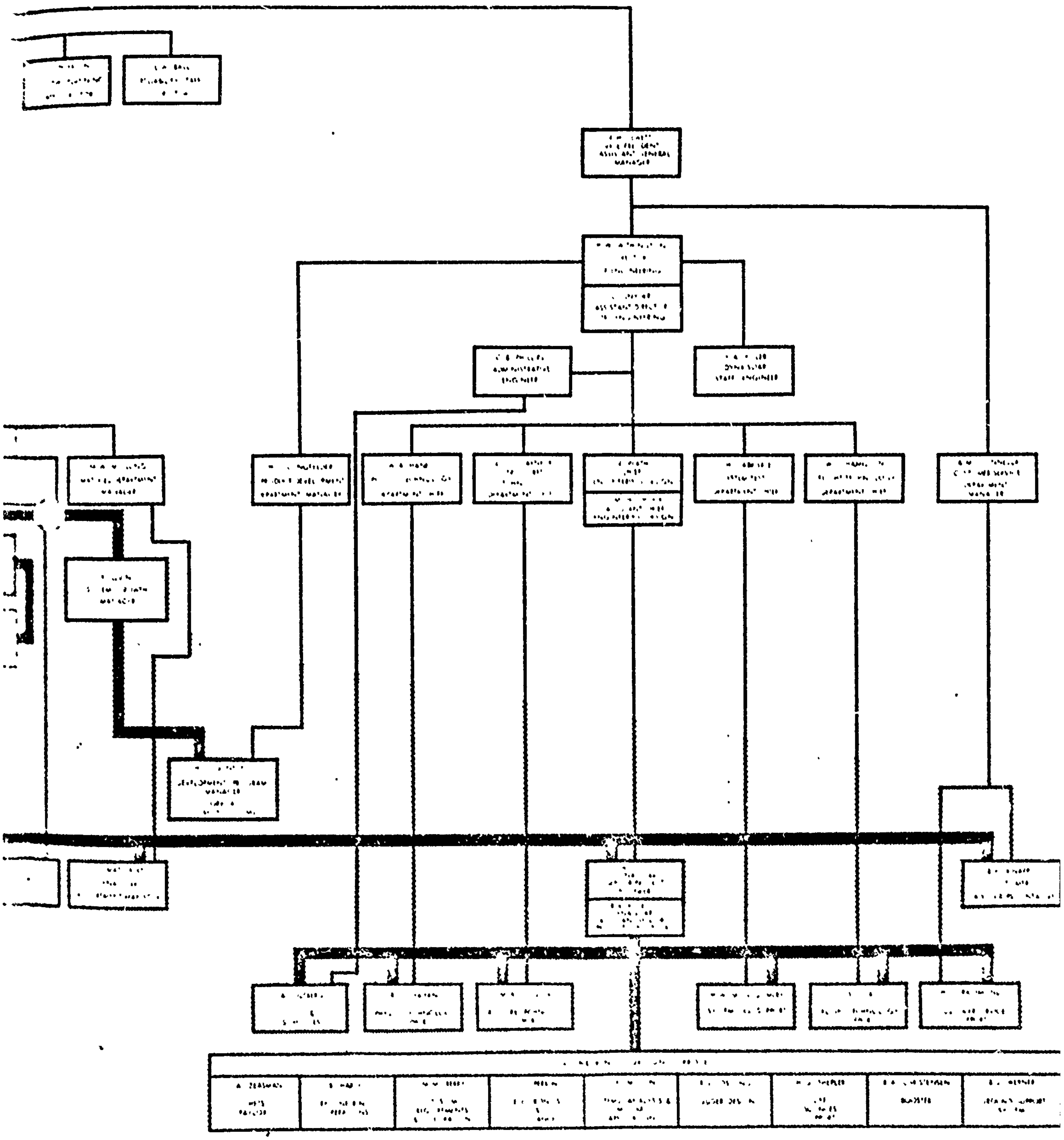


BOEING MANAGEMENT ORGANIZATION

Within the Boeing corporate structure the task of accomplishing the Dyna Soar Program has been assigned to the Aero-Space Division. This division is directed by Mr. Lysle A. Wood, Vice President - General Manager of the Aero-Space Division, who reports directly to Boeing President, Mr. W. M. Allen. Mr. Wood is assisted by Mr. George C. Martin, Vice President - Assistant General Manager, who has divisional responsibility for implementing and accomplishing major program contracts, and Mr. Robert H. Jewett, Vice President - Assistant General Manager in charge of Engineering and Product Development. Therefore, all functional line organizations within the Division, i.e., Engineering, Finance, Facilities, etc., report either to Mr. Wood, Mr. Martin, or to Mr. Jewett as shown on the Boeing Dyna Soar Program organization chart on page 1.0-6.

To facilitate the accomplishment of the Dyna Soar Program, Mr. George H. Stoner has been designated as Dyna Soar Program Manager. He has the authority to provide program direction to that section of each functional line organization which has been designated to support the Dyna Soar Program. The responsibilities and functions of the Dyna Soar Program Manager in relation to Boeing corporate structure and organizations are explained below and shown schematically on organization chart, page 1.0-6.

BOEING PROGRAM MANAGEMENT OFFICE

The primary responsibility of the Dyna Soar Program Manager, Mr. George H. Stoner, is to assure the complete and efficient execution of the tasks outlined in the statement of work and other exhibits as specified in the contract for the Dyna Soar Program.

To this end, the Dyna Soar Program Manager will perform the following functions:

1. Provide program direction to Boeing organizations to satisfy Air Force contractual requirements regarding the program.
2. Represent the System Contractor to the Air Force on all matters relating to the Dyna Soar Program.
3. Establish, and act as chairman of, a Management Council which will consist of representatives at senior management level of the System Contractor, the associate contractors, and major subcontractors. The Management Council will assist in determining policy and providing guidance for the Program.
4. Develop a Master Program Plan to present the sequence of accomplishing program objectives and a schedule for completing major milestones and task assignments.
5. Exercise control and surveillance over Program activities assigned to functional line organizations and the various subcontractors in order that a current program status will be available at all times.
6. Provide and utilize a method of coordination, integration, and summarization of program activities on a current basis so that problem areas in costs or schedules will be apparent at their inception. Take effective action to correct the problem areas.

The Program Manager is aided by Assistant Program Managers Mr. W. E. Ramsden and Mr. A. M. Johnston. In addition, Dr. J. F. Hofmann, responsible for the Reliability aspects of the program, and Mr. Ellis Levin, responsible for Systems Growth effort, report directly to Mr. Stoner.

Mr. Ramsden, Assistant Program Manager for Operations is responsible for program activities including establishment and documentation of the total program plan, the reporting of progress related thereto and the establishing and dissemination of work statements and operating directives. In the discharge of these responsibilities, Mr. Ramsden will maintain surveillance over the activities of and provide program direction to the Dyna Soar Contract Administration, Manufacturing, Facilities, Materiel, Quality Control and Finance organizations.

The Program Planning and Control Section, which is managed by Mr. R. F. Watt, reports to Mr. Ramsden and performs the following functions: Maintenance of the Master Program Plan, master phasing chart, work statements for major program elements, assuring the establishment of budgets for major program elements, contract compliance monitoring, preparation of forecasts, coordination of planning and control activity of customer and associate contractors and implementation of PEP.

Mr. A. M. Johnston, Assistant Program Manager for Design and Test is responsible for program management responsibilities associated with Design and Test. Customer Requirements, Systems Test and Systems Design Management, as well as the Dyna Soar field representatives, report to him. In the discharge of his responsibilities, Mr. Johnston will be primarily concerned with the activities of Dyna Soar Engineering with particular emphasis on System Design, System Test, Hypersonic Crew Requirements and Customer Liaison. In addition, Mr. Johnston has been named the System Contractor's Representative on the System Development Test Force.

1. The Systems Design Section is managed by Mr. B. Hamlin. Activities include establishment of technical requirements, assuring accomplishment of technical integration of System Design, and monitoring efforts affecting these areas within Boeing, Associate Contractors, Subcontractors and government agencies participating in the program.
2. The Systems Test Section is temporarily managed by Mr. B. Hamlin. Activities include establishment of technical requirements and assuring accomplishment of technical integration of systems test functions, range activation and monitoring effort affecting these areas within Boeing, Associate Contractors, Subcontractors and government agencies participating in the program.
3. The Customer Requirements Section, managed by Mr. P. F. Sanders, serves as a focal point of coordination with the Air Force and NASA on "non-contractual" customer requirements including the publication of Meeting and Commitment Calendars, the administration of program correspondence, and coordination of associate contractor requirements.
4. Hypersonic Crew Requirements, reporting directly to Mr. Johnston, are represented by Messrs. W. C. Becker and R. C. Cokeley. Responsibilities are primarily concerned with the human factors and pilot consideration aspects of the system design.

5. Boeing Dyna Soar Associate Contractor Representatives report directly to Mr. Johnston and provide liaison with associate contractors at their facilities.

The Dyna Soar Reliability, Fire and Safety Section, managed by Dr. J. F. Hofmann, reports directly to the Program Manager. Activities include the direction of all Boeing effort related to Dyna Soar System Reliability and Safety together with systems integration efforts in these areas.

The Dyna Soar Systems Growth Section, managed by Mr. Ellis Levin, who reports directly to the Program Manager, is generally concerned with the Dyna Soar Program and technology beyond Step I and with making certain that provision is made in Step I to meet growth requirements. More specifically, this includes (a) the potential use of Dyna Soar hardware and technology in operational systems, (b) potential military and scientific subsystems (such as radars, photographic and infrared sensors, orbital maneuvering engine, etc.), and provisions for their testing in the Dyna Soar military test system, (c) Step IIA studies, (d) comparative studies of alternate approaches to Dyna Soar objectives, and (e) associate research and development useful to the Dyna Soar Program. Through its Manager, the Systems Growth Section advises and assists the Program Manager in these areas and gives program direction to functional organizations on these subjects.

The Dyna Soar Program Manager also has at his disposal, in addition to the above activities, the services of the outlying Boeing office representatives who provide direct liaison with government agencies on an expedited basis.

In summary, the several elements of the Dyna Soar Program Management Office described above consitute a strong, cohesive management team which provides a responsive focal point of contact within Boeing for all elements of the Air Force and Associate Contractors concerned with the Dyna Soar Program. It operates to integrate the activities of all Boeing organizations working on Dyna Soar and to assure over-all coordination of Boeing activities with those of subcontractors, Associate Contractors and all U. S. Government agencies involved in the Dyna Soar Program.

## FUNCTIONAL ORGANIZATIONS

Within each functional line department in the Aero-Space Division, a Dyna Soar organization has been designated. Each of these organizations receive administrative and functional policy direction from its respective functional department head; however, program direction is provided to each organization by the Dyna Soar Program Manager. The efforts of all such organizations are coordinated within the Boeing complex under the general direction of the Dyna Soar Program Manager. The major functional organizations which have been established to accomplish the Dyna Soar Program are listed below with a brief description of their function.

1. Engineering

   The Dyna Soar Engineering Project is managed by Mr. J. H. Goldie who is assisted by Mr. R.R. Rotelli. The following Engineering Project Sections have been established to direct the Dyna Soar engineering efforts:

   Systems Analysis and Military Applications

   System Requirements and Integration

   Glider Design

   Booster

   Ground Support System

   Electronics and Guidance

   Life Sciences Support

   HETS Payload

   Engineering Operations

The functions of the Project Organization include system design and development testing as well as program direction of the following engineering support organizations:

Staff Engineer

Structures Technology

Flight Technology

Physics Technology

Systems Test

Customer Service

Cost and Schedules

This organization also provides assistance to the Dyna Soar Program Manager in establishing engineering policy and plans, and in reporting technical progress.

2. Contract Administration

The Dyna Soar Contract Administration Section is managed by Mr. N. B. Loomis. Its function includes: (1) negotiation and administration of the Dyna Soar System Contract; (2) interpretation of contractual requirements and conditions; (3) release and control of work authorizations within Boeing; (4) coordination of the use of government property and bailed items; (5) surveillance of program activities to assure compliance with contract requirements and; (6) submittal to the Air Force of data and reports required by contract and other evidence of completion of contractual obligations.

3. Manufacturing

The Dyna Soar Manufacturing Section is managed by Mr. L. B. Barlow. Its primary responsibility is to accomplish on schedule conversion of engineering releases into hardware in a minimum of flow time and at a minimum cost. Its functions include: (1) Assistance to the Program Manager in the establishment of manufacturing policies and plans; (2) surveillance over the execution of the manufacturing program and status reports to the Program Manager; (3) analysis of the design to assure design producibility and that manufacturing capability is available when required; (4) direction of the fabrication of all parts and tools; and (5) analysis of the manufacturing capability of potential sources of procurement to assist in the selection of subcontractors.

4. Materiel

The Procurement Section is under the direction of Mr. J. E. Mathiasen. The primary responsibility of this section is to procure all materials, parts, equipment, subsystems, subcontract work, etc., as required to satisfy the quality, cost and schedule requirements, of the Dyna Soar Program. Its functions include: (1) Assistance to the Program Manager in make-or-buy decisions; (2) direction to source evaluation boards and survey teams in the analysis of the capabilities of potential sources of procurement; (3) development of plans and policies regarding subcontracts and detailed procurement activities required to fulfill the subcontract plan; (4) negotiation, management and control of all major subcontracts and; (5) provision of a focal point for all formal contact between the Program Manager or other Boeing organizations and prospective or actual subcontractors.

5. Finance

The Dyna Soar Finance Section is managed by Mr. L. B. Ludford. Its primary task is to develop and provide cost and other financial data to the Program Manager for the purpose of establishing contract price and for the control and accountability of program costs. The functions of this section are: (1) preparation of cost studies, including fiscal year funding estimates for the Program Manager; (2) development of cost data to be used by Contract Administration in negotiating prime contracts; (3) assistance to the Procurement Section in the establishment of costs for the work assigned to subcontractors and; (4) integration of all cost reporting activities required for the program.

6. Facilities

The Dyna Soar Facilities Section is directed by Mr. E. W. Reischl. The Section is responsible for the integration of facility activities by the contractor, associate contractor(s), subcontractors, and test base agencies. as well as directing and coordinating all contractor facility activities. Its functions include: (1) formulation of policies and plans related to the provisioning and implementation of new facilities and major rearrangements of existing facilities to accomplish program objectives; (2) assuring that program plans are consistent with facility capabilities and compatible with Air Force facility policies; (3) providing technical data and status information regarding facilities activities, and (4) coordination with other facility sections (i.e., engineering operations, etc.) to carry out Dyna Soar facility plans.

7. Quality Control

The Dyna Soar Quality Control Section is directed by Mr. J. P. Tronquet. It has the primary responsibility of assuring that the product conforms to drawings, specifications and established standards of quality throughout all phases of manufacturing and test. The Section's major functions are: (1) coordination with Engineering regarding quality assurance during design, fabrication and test; (2) maintenance of accountability records of quality activities and decisions upon which acceptance of items or operations is based; (3) coordination and control to prevent, correct and preclude repetition of discrepancies in the product; (4) accumulation of reliability data as required for Engineering; (5) maintenance of a system for calibration and certification of all measurement and test equipment and configuration control of such equipment; (6) monitoring of the quality of vendor and subcontractor products and reporting of discrepancies to establish vendor/subcontractor reliability status; (7) periodic surveys of the activities of supporting Quality Control organizations to assure compliance with established procedures and processes; and (8) preparation of Quality Control progress and status reports for the Dyna Soar Program Manager.

RELIABILITY

The Dyna Soar Reliability and Safety Organization within the Boeing Aero-Space Division consists of multiple integrated elements.

In addition to the Reliability and Safety Program Manager, each functional department (Engineering, Manufacturing, Quality Control, and Materiel etc.) has a Dyna Soar Reliability representative. The Reliability and Safety Manager coordinates the various departmental efforts to assure timely task accomplishment.

1. The Dyna Soar Engineering Reliability representative, reporting to the Dyna Soar Engineering Senior Project Engineer, is responsible for the accomplishment of those elements of the Reliability program associated with design, development, and testing of the system. He establishes the detail schedule and requirements for activities such as failure analysis and design reviews and follows up to assure their timely accomplishment. He coordinates with the development test planners to assure adequacy of the program for providing necessary reliability data. With the support of the Aero-Space Division Design Assurance Section, he provides for centralized data collection and approved parts lists to assist the designer in the accomplishment of failure (reliability and safety) analyses and design reviews.

   He also initiates training programs, as necessary, to indoctrinate engineering management and personnel in the methods of design and test to achieve Dyna Soar reliability and safety requirements at a minimum cost. Additional engineering reliability and safety efforts are provided by reliability specialists in the engineering staffs.

The design and test engineers are responsible for adequate consideration of reliability and safety in their efforts. In particular, it is the responsibility of the design engineer, with advice and assistance from reliability specialists, to accomplish the required reliability and safety failure analyses, and control failure recurrence by design changes.

2. The Manufacturing reliability representative is responsible for review of production procedure documentation, for failure recurrence control by production changes, for keeping program and engineering management aware of potential problems and for the training of manufacturing personnel to realize the importance of their role in producing a safe and reliable system.

3. The Quality Control reliability representative is responsible for coordinating the program reliability objectives and their means of achievement with all affected Quality Control organizations. He assures the Quality Control Department's compliance with program reliability requirements and establishes adequate failure reporting. He recommends training of Quality personnel to emphasize the primary importance of reliability.

4. The Materiel reliability representative assures adequate consideration of reliability and safety requirements in the selection of subcontractors and vendors, specification of reliability requirements in subcontracts and assists the Program Reliability Manager in monitoring compliance with reliability program requirements. Under the direction of the Program Reliability Manager and with the assistance of the Engineering and Quality Control Representative, he conducts evaluation surveys of the

reliability programs of prospective subcontractors, and provides guidance to them on the requirements of the Dyna Soar Program.

SPECIALIZED SUPPORT ORGANIZATIONS

To facilitate carrying out the policy and direction established by the Dyna Soar Program Manager any of the above representatives may enlist the support of specialized staff groups and organizations such as the Boeing Scientific Research Laboratories, Mathematical Service Organizations, etc.

ASSOCIATE CONTRACTOR PROGRAM MANAGEMENT ORGANIZATIONS

The Program Management organizations of The Martin Company, Associate Contractor for the booster and the Aerojet-General Corporation, Associate Contractor for the booster engines, are described below. Similar organization descriptions will be added to this section as additional associate contractors are selected.

MARTIN PROGRAM MANAGEMENT ORGANIZATION

The management of a space booster program utilizes very nearly all of the functions and operations of a major Weapon System Contractor.

These diverse activities can become fully effective only when they are welded into a single-purpose team. The Martin Company has accomplished this through the Program Manager concept, which it introduced in 1953.

The Dyna Soar Program Manager is given the resources and dollars required to carry out his responsibility for the program. He has the authority delegated by the Board of Directors, through the Vice President and General Manager, to commit the Company and is, in effect, the general manager of a company within the Company. (See Page 22.)

The Program Manager and his directly assigned team managers issue all directives describing:

What.

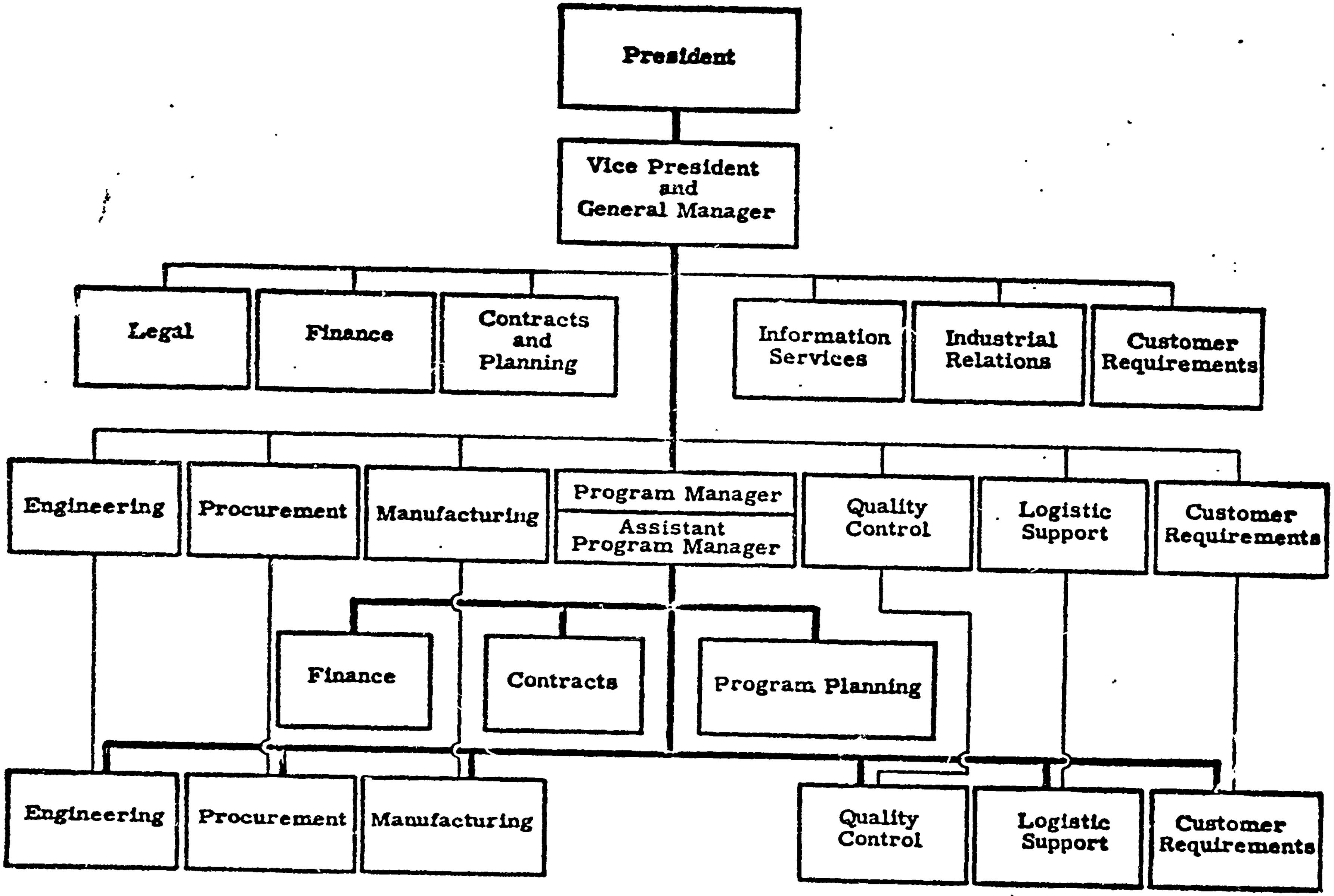
For how much.

When.

How.

Functional team managers are indirectly assigned to the Program Manager and, by application of the "how", transform directives into finished work.

All team managers, whether direct or indirect, are concerned only with Dyna Soar, and they are physically located in area of the Martin-Baltimore Engi-




MARTIN COMPANY - DYNA SOAR STEP I BOOSTER PROGRAM ORGANIZATION neering Building specifically allocated to this program.

This breakdown of directly and indirectly assigned team managers is a thoughtful application of many years of experience that has resulted in the thoroughly practical balance of the best features of the strict project-type organization and the functional-type organization. The functional organization supplies continuity in personal administration and technical development. The direct line provides for unity in control and direction. Together they provide stability and flexibility.

Contracts Manager

The basis for all work accomplished is the contract with its attendant statements of work and specifications. The prime responsibility of the Dyna Soar Contracts Manager is to interpret this contract and to define the work to be done by functional Dyna Soar Managers and other Martin Divisions. The Contracts Manager must, therefore, maintain a close liaison with customer personnel to negotiate work items, statements of work, specifications, terms and conditions and legal considerations that are mutually understood and acceptable.

The Program Contracts Manager, who reports directly to the Program Manager, accomplishes these tasks with the assistance of a staff consisting of a Contracts Technical Requirements Manager for specifications and required Assistant Contracts Managers, and Technicians. In addition, he is advised by the Director of Contracts and Planning (on the Vice President and General Manager's Staff) and legal representatives.

Thus, the Contracts Manager will define the "what".

FINANCIAL MANAGER

The Program Financial Manager performs Program pricing, contract negotiation of price and financial terms, manpower projection and control, cost control, financial status reporting and general liaison with the Martin-Baltimore Finance Department. The financial implications of all program decisions and performance are reviewed by the Program Finance Manager, and he advises the Dyna Soar Program Manager and the Division General Manager's Staff of the recommendations resulting from such reviews.

The Program Finance Manager is assisted in fulfilling his function by a staff of skilled and experienced estimators, industrial engineers and accountants. In addition to this group under his direct control, he receives assistance from the Director of the Finance Division and his entire staff. Support programs involving Martin-Denver and Martin-Cocoa will assign specific financial representation at their facilities to provide appropriate emphasis on the Dyna Soar Program. These representatives provide the Finance Manager with such estimating and control data necessary to enable him to monitor the financial progress at these other Martin Divisions. The Finance Manager will define "how much".

PLANNING MANAGER

The Dyna Soar Planning Manager is the originator and controller of the Program Master Plan and Phasing Chart and the multitude of implementing phasing charts. He coordinates closely with the customer, the system contractor and associate contractors. He schedules the work of each of the Martin functional team managers as well as supporting Divisions. Any schedule incompatibilities are resolved by him to assure the smooth and timely performance of the total effort. He detects all deviations from the established plan and reports to the Program Manager action taken or required.

The Planning Manager reports directly to the Program Manager and can draw on the resources of the Director of Contracts and Planning on the Vice president and General Manager's staff for assistance.

The Dyna Soar Planning Manager must define the "when".

TECHNICAL DIRECTOR

The success or failure of a space program is, to a great degree, dependent upon the quantity and quality of its engineering effort. Engineering responsibility on the Dyna Soar Booster Program is vested in the Technical Director. As the title implies, the Technical Director is more than a project engineer. All of the engineers performing direct work on the program report to him, not through a technical department chief, but directly to him, so that technical decisions, as well as engineering management, are his responsibilities. He must be satisfied that the booster design is sound, and the fact that a man will be aboard underscores this responsibility even deeper. He reports to the Director of Weapon System Engineering directly and indirectly to the Program Manager. He is assisted by a staff of Assistant Technical Directors, each of whom is responsible for a technical portion of the total effort. All indirect Engineering support perform their work under the guidance of this Engineering team.

Manufacturing Manager

The Dyna Soar Manufacturing Manager is responsible for everything on Dyna Soar Program that is manufactured by any segment of The Martin Company. He has the responsibility for producing the article described by Engineering. Also under his direct control are the assembly and production verification tests. Reporting indirectly to him are detail fabrication, tooling, production planning and the manufacturing work of other Martin Plants (controlled and directed by the Dyna Soar Manufacturing Manager when working on Dyna Soar).

He is responsible for setting up and controlling a manufacturing schedule and cost control plan consistent with the Master Phasing Chart and the budget issued to him by the Finance Manager. He is assisted by his personal staff and reports directly to the Director of Manufacturing and indirectly to the Dyna Soar Program Manager.

QUALITY PROGRAM MANAGER

Each successive large booster or ICBM firing brings into sharper focus the extremely sensitive part played by Quality Assurance. The most carefully designed product can be transformed into a catastrophic failure by the slightest construction or handling oversight. It is the duty of the Quality Program Manager to ensure that every detail and operation is performed correctly.

The administration of the Dyna Soar Quality Assurance and Reliability Program is the responsibility of the Quality Program Manager. He has established four major sections to accomplish this task:

The Quality Planning Section performs administrative planning and coordination.

The Quality Engineering Section provides technical assistance.

The Quality Reliability Section is the Dyna Soar reliability administrator.

The Quality Measurement Section is generally the Dyna Soar inspector.

The Quality Program Manager reports directly to the Director of Weapon System Quality and indirectly to the Dyna Soar Program Manager.

LOGISTIC SUPPORT MANAGER

The Dyna Soar Logistic Support Manager is responsible, directly to the Director of Logistic Support and indirectly to the Dyna Soar Program Manager, for providing the support which will assure the maximum operational effectiveness of the delivered product. His effort is divided into three main areas:

Material Support.

Technical Publications.

Training and Technical Support.

Material support is generally that area of support which assures proper spares support, provides on-site modification kits or replacement and maintains a repairable parts system. Technical Publications provides timely field publications and instruction. Training and Technical Support will be principally composed specialized Martin training and customer familiarization.

PROCUREMENT PROGRAM MANAGER

The Procurement Program Manager is responsible for all procurement activity on the Program. In this capacity, he reports directly to the Director of Material and Procurement and indirectly to the Dyna Soar Program Manager. He maintains surveillance over all procurement effort on the Program, including the purchase of materials, services, supplies, major components and subassemblies within the established prices, specifications and delivery schedules.

CUSTOMER REQUIREMENTS MANAGER

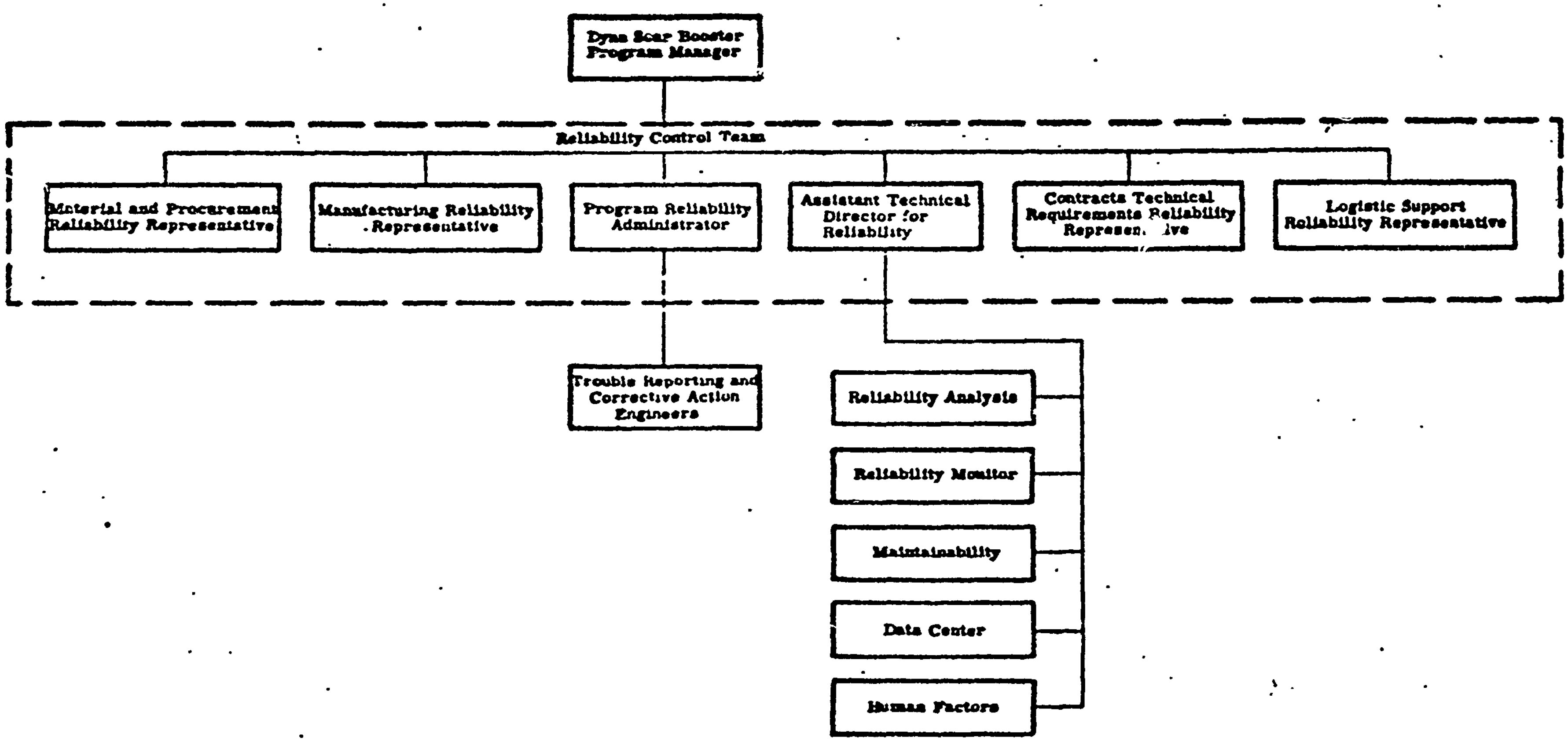
The Customer Requirements Manager maintains close liaison with all phases of the customer's Dyna Soar activity, in order to assure that Air Force requirements are properly anticipated in terms of both current work and future needs. He reports directly to the Director of Customer Requirements (Vice President and General Manager's staff) and indirectly to the Dyna Soar Program Manager.

RELIABILITY PROGRAM MANAGEMENT

Organization

Program Reliability Control Team. The Dyna Soar Program Manager is responsible for administering the Dyna Soar Reliability Management Program through the Reliability Control Team. The Program Reliability Administrator acts for the Program Manager as chairman of the Dyna Soar Reliability Control Team (Page 28). In this capacity, he will be responsible for the adequacy and execution of the Reliability program through the members of the Reliability Control Team.

Each team member will be responsible for planning and organizing the reliability effort of his respective department and shall:




MARTIN COMPANY - DYNA SOAR BOOSTER ORGANIZATION FOR RELIABILITY

Assure that each of his departmental reliability tasks is carried through to completion by means of the indicated control method. These tasks are summarized in the Martin Reliability Management (MRM) Program outlined in Section G of this chapter.

Bring to the attention of the Control Team all reliability problems affecting his department.

AEROJET PROGRAM ORGANIZATION AND MANAGEMENT

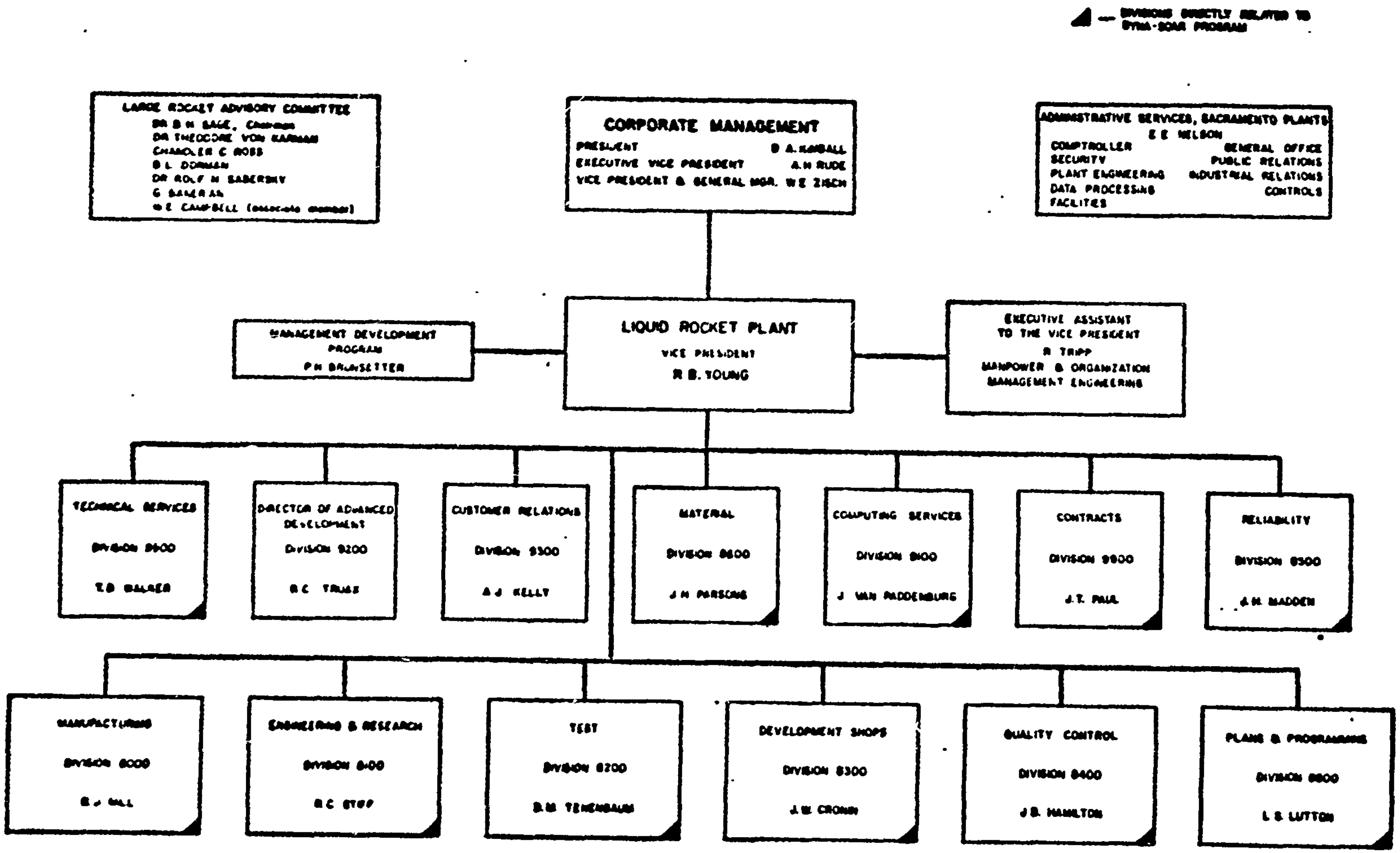
At the Aerojet-General Corporation, emphasis is placed not only upon competent technical personnel to fulfill propulsion assignments but equally upon their organization into efficient, integrated project teams.

Separate administrative units, organized by engineering specialty, form the core of Aerojet's management policies. Specially established project teams, in turn, coordinate their effort with that of established departments. A flexibility in approach is maintained as each unit, either newly formed or already established, brings to a particular task the special experience and the specific engineering knowledge gathered from earlier programs.

The Liquid Rocket Plant at Sacramento was established in 1955 as the center for much of Aerojet liquid propellant research, development, and production. Although corporate headquarters are located in Azusa, a number of corporate officers are assigned to Sacramento to assure continuity of engineering and administrative effort.

LIQUID ROCKET PLANT ORGANIZATION

While the Aerojet-General Corporation is currently engaged in several large propulsion programs, the smaller program is never permitted to suffer delay or mitigation of effort. Priorities may necessarily differ from program to program, but the administrative organization, as shown on page 31 allows each program manager direct access to top-level management and thus grants him the ability to secure decisions rapidly. Immediate attention is given by management to such problems and work requirements.




AEROJET-GENERAL - LIQUID ROCKET PLANT ORGANIZATION

The Dyna Soar program, for example, will be directed by a manager who reports directly to the manager of the Engineering and Research Division. In this way, the project will rank equally with similar projects underway at the Liquid Rocket Plant.

Definition and accomplishment of design and performance objectives are but two of the responsibilities of the program manager. The meeting of program objectives also resides with the manager. Likewise, he is responsible for balancing accomplishments with program goals and for the constant monitoring of engineering effort to assure rapid and prompt achievement of all scheduled tasks. In addition, he directs all phases of program control, including fiscal reporting, fiscal monitoring, planning, and contract requirement reporting.

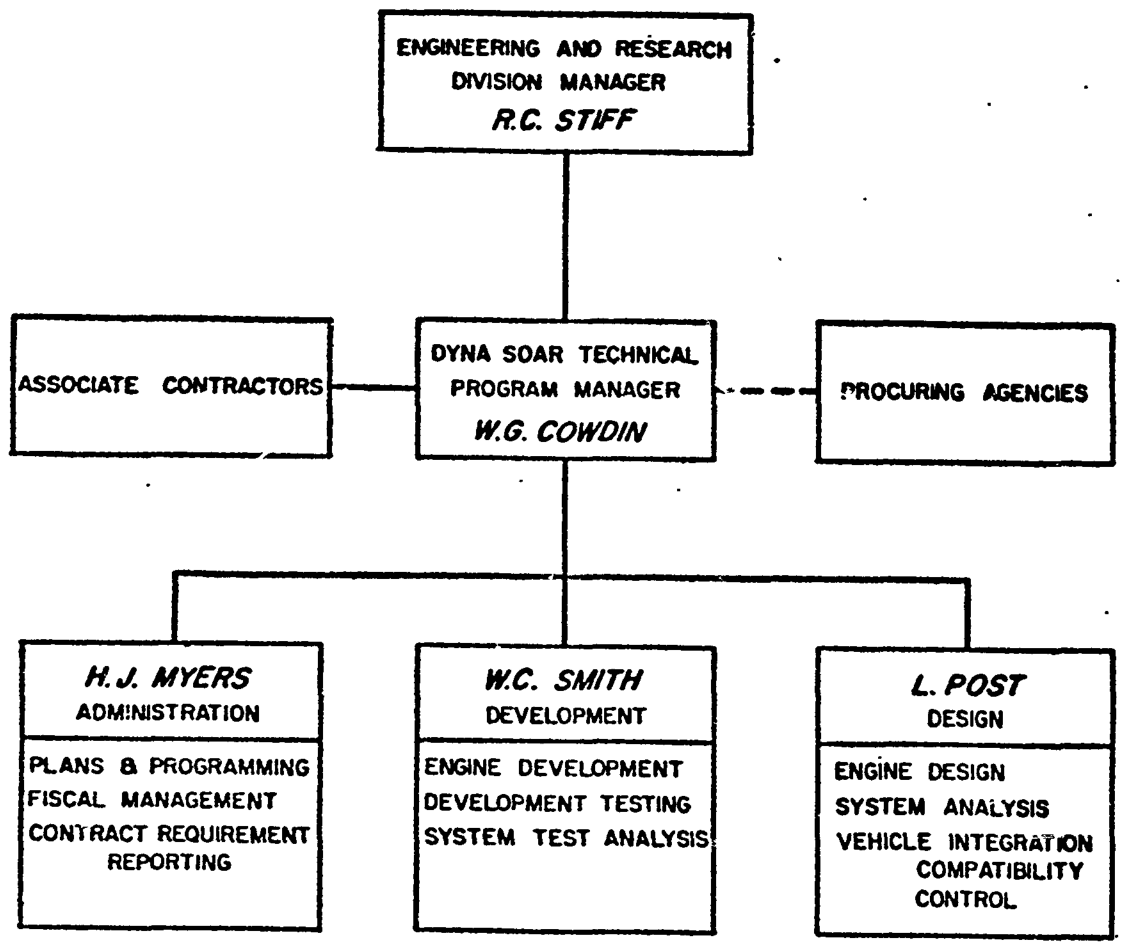
ENGINEERING AND RESEARCH DIVISION ORGANIZATION

In the Engineering and Research Division, as throughout the Liquid Rocket Plant, existing departments will serve as support for the Dyna Soar program. Page 35 illustrates the organization of the division and the relation of the program to existing departments.

The program manager is authorized to direct the efforts of several departments toward solution of any problems that might arise. Coordination of the activities of the various departments and the program by the manager guarantees everyday broad engineering capability. System and component design, fabrication, testing, and design changes are also within the province of the manager who is authorized to call upon other departments to assist him in these duties.

PROGRAM MANAGEMENT ORGANIZATION

Within the program itself, an organization similar to that of the Liquid




AEROJET-GENERAL – DYNA SOAR PROGRAM MANAGEMENT

Rocket Plant will be established. Page 33 depicts the program management organization.

Responsibility for direction of the program rests with the program manager who also coordinates the activities of supporting groups as they pertain to the program. Established departments support the program to ensure maximum effort and the full assignment of Aerojet technical and administrative experience.

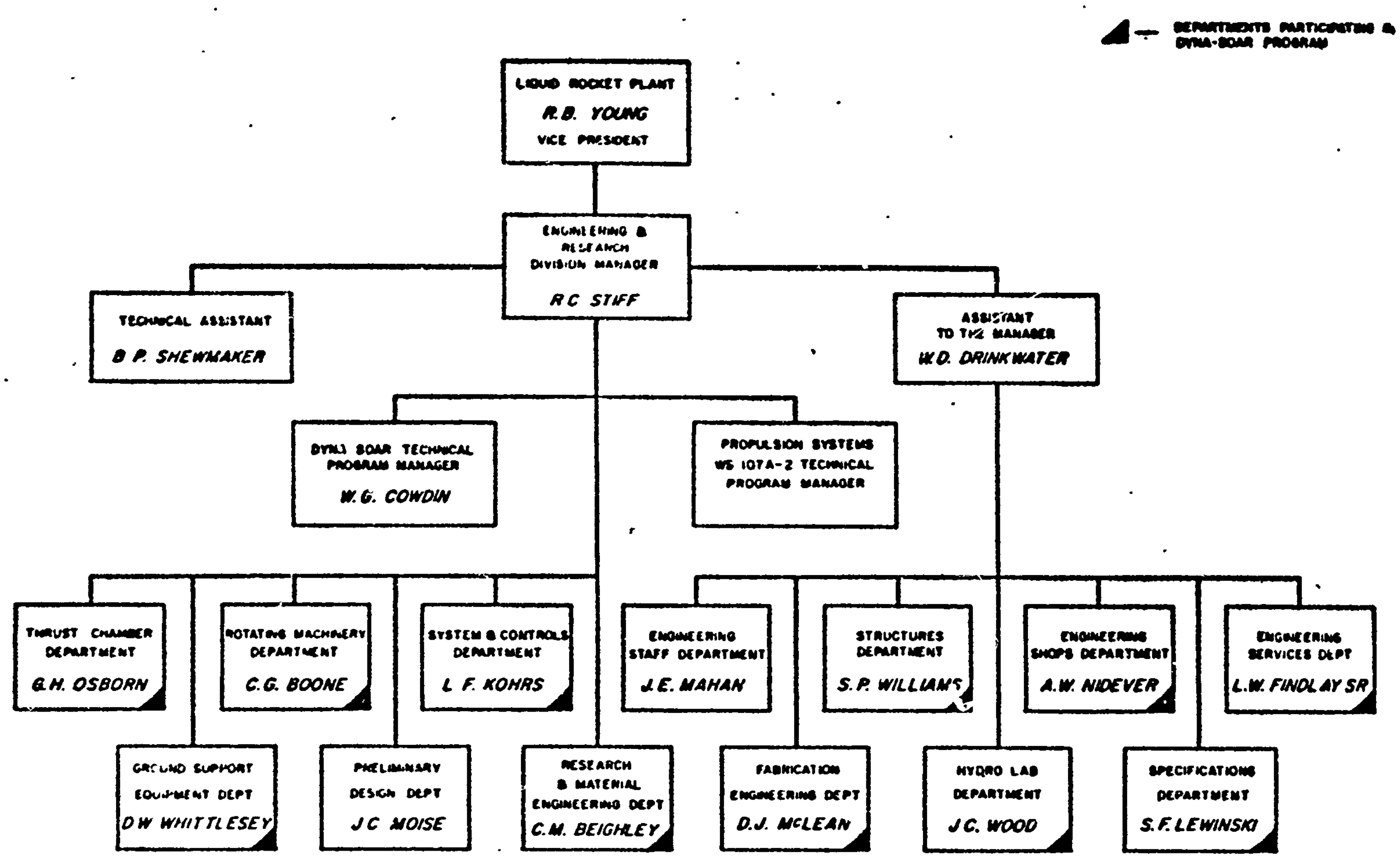
Liaison between the procuring agencies, the associate contractors, and Aerojet is established by the program manager and his staff. Each of the administrative units within the program possesses sufficient independence to complete its assignment without delay; over-all control, however, is retained by the program manager.

CONTRACT ADMINISTRATION

As part of the Liquid Rocket Plant administrative procedures, a contract coordinator is assigned immediately upon award of the contract. His duties encompass all contractual aspects of the project. All work orders are issued by the coordinator, who also determines that budgets are established and maintained on a current basis. Once a budget is prepared, it is subject to rigorous examination by management and the budget control section.

Working closely with the program manager, the coordinator continually monitors the operations of the program to assure that all requirements of the contract are met according to schedule. The coordinator serves also to apprise management of the financial and performance status of the program.

Before work is begun on the contract, a review committee is appointed by the manager of the Engineering and Research Division to establish plans,




AEROJET-GENERAL - ENGINEERING AND RESEARCH DIVISION ORGANIZATION

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budgets, and cost controls. The contract coordinator participates in the work of the committee with the program manager, accounting personnel, and representatives of the departments and divisions which will participate in the program.

QUALITY CONTROL

Quality control at Aerojet has played an important role in the success of the corporation and of its products. While the individual departments are not relieved of the responsibility of maintaining high quality, the Quality Control Division establishes standards and continually monitors Aerojet projects to assure customer satisfaction.

Some of the ways in which this is accomplished:

1. Vendors are evaluated in terms of quality and their ability to provide products promptly and at minimum cost.

2. Sampling procedures and a historical file indicating the past records of vendors provide a continuing inspection procedure.

3. Continuous sampling of the performance and reliability of Aerojet products provides a continuous record and thus a program of product improvement.

MATERIAL DIVISION

The Material Division controls all subcontracting activities of the Aerojet-General Corporation. Procurement, purchase, and fabrication of materials, as well as their receiving, storage, and handling are the major responsibilities of the division.

Where experience shows their desirability, new methods are installed to simplify procurement procedures, mechanize records, and reduce costs. In addition, the Material Division maintains stores of commonly used materials throughout the Aerojet plants to meet emergency needs that might arise. The division's inventory control system also provides current information on the availability of supplies to prevent untimely depletion.

PERSONNEL

Dyna Soar program personnel will be drawn from a newly organized department, established specifically within the Engineering and Research Division for direction of the program, and other Liquid Rocket Plant departments and divisions. Experienced personnel thus will be temporarily assigned to the project for a particular task or to solve a particular problem.

# DYNA SOAR STEP I PROGRAM

## GROUND RULES

The following ground rules were used in developing the Dyna Soar (Step I) Program:

A. General

1. Approach

   An R&D System approach is assumed and requirements unique to weapon systems shall not be included.

2. Insurance Programs

   Insurance or back-up programs should be held to a minimum and shall be terminated at the earliest possible date.

3. Deferment of Contingency Costs

   Assume that a minimum but a sufficient number of first-process developments or tests are made to furnish enough data for the establishment of an acceptable technical confidence reliability level consistent with the overall system requirements.

4. Safety

   System design shall provide inherent pilot safety.

5. Reliability

   The reliability of the Dyna Soar (Step I) System shall be as follows:

   Pre-launch checkout and countdown - 95% and Flight - 85%.

6. Man-Rating

   Man-rating requirements of Dyna-Soar Step I vehicle shall be in accordance with approved reliability and safety criteria as determined by the Trade Studies. Man-rating requirements for booster shall be as currently established and will include a reliable malfunction detection system.

7. Contractors

| | | |
|---|---|---|
| a. | Glider & System | Boeing - System Contractor |
| b. | Booster | Martin - Assoc. Contractor |
| c. | Boost Engines | Aerojet - Assoc. Contractor |
| d. | Primary Inertial Guidance | ** - Assoc. Contractor |
| e. | Communications | ** - Assoc. Contractor |
| f. | Booster Guidance | ** - Assoc. Contractor |

** To be determined

A. GENERAL (Cont.)

8. GFAE

The AR-2 acceleration engines will be manufactured by Rocketdyne. Other propulsion units will not be GFAE but will be furnished by Boeing.

9. CTCI's

CTCI's will be separate at Baltimore and Seattle - Booster and Glider respectively.

10. Static Proof Tests

Static proof tests shall not be conducted on the booster-glider combination.

11. Mockup and DEI's

Mockup inspection and DEI's will be held in Seattle.

B. GLIDER

1. The Step I Glider shall be readily adaptable, with minor modification, to the Step IIA Program.

2. Go-Around Capability

No landing go-around capability shall be designed into the Step I Glider but the design shall be capable of accepting a glide stretching landing engine at the expense of the payload.

3. Escape System

The escape system shall provide escape from malfunctions with the modified ICBM system during boost phase of flight and any subsequent phases of flight.

4. Glider/Booster Testing

a. Assume Glider/Booster compatibility and dynamic testing to be accomplished at Martin-Baltimore using ground test glider provided for that purpose. Subsequent gliders will not be tested in Baltimore but will be checked out with the booster at AMR. Final test site to be determined by "Optimum Glider/Booster Test Program Trade Study".

b. The ground test glider will be returned to Seattle for continuing engineering work after the compatibility tests are completed.

B. GLIDER (Cont.)

5. Vehicle Renovation

a. The first post hypersonic flight refurbishing will require the glider to be stripped of all sub-systems. The degree of equipment removal from subsequent gliders will be based on previous refurbishing experience, with minimum removal an objective.

b. Assume glider refurbishing without major instrumentation or subsystem changes.

c. All refurbishing of glider will be accomplished at Seattle.

d. Glider refurbish flow time is $6\frac{1}{2}$ months (shoot to reshoot).

6. Capsules

The design and manufacture of the escape capsules will be accomplished by the Boeing Airplane Company. The capsule development and qualification test program will be based on ten (10) escape capsules. The above plans may change upon resolution of Trade Studies.

C. BOOSTER

1. Configuration

The booster shall be a modified version of the SM68 Titan ICBM.

2. SM 68 Program

There is to be no interference with the SM 68 Titan program (s).

D. SUPPORT

1. Pilot Ground Crew Training

a. Plan a pilot training program for contractor, USAF, and NASA pilots.

b. Assume that the Air Force has a simulator for pilot training.

c. No ground crew training will be provided.

2. OCAMA Support

a. OCAMA support shall be limited to providing standard GFE activities.

b. Boeing will handle spares for test systems.

c. Minimum service experience shall be recorded for OCAMA.

3. Glider Transportation

Gliders are to be transported by Air Force C-124's provided and operated by the government.

D. SUPPORT (Cont.)

4. Booster Transportation

Booster are to be transported by A. F. C. -133 provided and operated by the government.

5. Support Aircraft

a. Modification of one B-52 only shall be provided out of Dyna Soar Funds.

b. High performance and other support aircraft will be furnished by government.

c. The B-52 and other AFFTC & AMR support aircraft will be maintained and operated by the USAF.

d. AHF-106B support aircraft will be bailed to BAC.

E. FACILITIES

1. Pads

a. One modified launch pad with two holes and a modified blockhouse are to be provided at AMR.

b. Launch complex is to be available April, 1962

2. Communication

a. Range facilities may be planned to provide voice communication less than 100% of the time.

b. Experimental super high frequency equipment is required.

c. Air Force ground radio guidance system expected to be in existence at AMR, will be assumed satisfactory and available.

3. Tracking

Existing down range tracking stations shall be used where required and any additional down range tracking stations are to be provided by the government.

4. Denver

No Dyna Soar compatibility testing is planned at Denver.

5. Landing Sites

There shall be three down range landing strips 8, 000 ft. by 150 ft.

6. AFFTC AFMTC and Down Range

Maximum use of existing facilities, with only minor modifications, at AFFTC, AFMTC and Down Range will be provided.

G. GROUND SUPPORT EQUIPMENT

1. Ground support equipment shall be designed where possible so that a single configuration will satisfy the needs of assembly, preflight and maintenance.

G. <u>GROUND SUPPORT EQUIPMENT (Cont.)</u>

2. **Utilize the optimum combination of automatic checkout equipment and skilled personnel consistent with low cost, program timing, and confidence level.**

## SYSTEM DESCRIPTION

### AIR VEHICLE SYSTEM DESCRIPTION

The Dyna Soar Step I Air Vehicle, with a lift off weight of approximately 241,500 pounds, is composed of a piloted glider, a glider to booster transition section, and a two stage booster adapted from the boost system of the Titan SM-68 ICBM. The over all length is 116 feet, 4.5 inches.

The air vehicle system described in this section will be refined by continued study, design and development. A specific design refinement period is planned which culminates in an air vehicle and DS-1 system configuration fix by February 26, 1961. Typical design refinement objectives are:

1. Improve temperature safety margins.
2. Simplify and improve reliability of the escape system.
3. Reduce the use of molybdenum and other exotic materials.
4. Refine stability and control characteristics.
5. Refine the glider design for the effects of thermal distortion.
6. Reduce communication problems caused by local environments.

Of particular concern during the design refinement period of the glider is the need for improvement of the stability and control characteristics at hypersonic speeds. It is desirable to minimize the shift in aerodynamic center from transonic to subsonic speeds so that static stability exists throughout the speed range. Two methods under study for reducing aerodynamic shift are use of retractable wing tip extensions and vertical fins with dihedral. Other investigations include fillets at the body-wing intersection, body contour and wing cambers, elevon planform and hinge line sweep variations, and rudder deflection. All of these variables will be investigated analytically in conjunction with wind tunnel programs. The final configuration selection will be based on aerodynamic performance, structural requirements, subsystem configuration, over all weight, reliability, cost, and technical confidence.

Due to the research nature of the Dyna Soar Step I Program it is not possible to precisely specify all of the air vehicle system parameters. The data presented are the latest available and will be refined throughout the design refinement time period.

Each stage of the booster contains a liquid bi-propellant power plant, propellant tankage and pressurization system. The Stage I propellant is $LO_2$ oxidizer and RP-1 fuel and is supplied to the engine pumps from the helium gas pressurised propellant tanks. The power plant is an XLR87-AJ-3 Aerojet General bi-propellant turbo-pump fed rocket engine, rated at 300,000 pounds thrust at sea level. Two identical thrust chamber assemblies are utilized. Variations from the Stage I Titan booster for the Dyna Soar are as follows: Prevalves must be added in the main fuel and $LO_2$ between propellant tanks and the main pump inlet; in addition, stabilizing fins and necessary structural revision for increased loads must be provided. The exposed fin area in the pitch plane is 438 square feet, and in the yaw plane, 175 square feet.

The Stage II propellant also is $LO_2$ oxidizer and RP-1 as noted in Stage I. The power plant is an XLR-91-AJ-3 Aerojet General bi-propellant turbo-pump fed rocket engine, rated at 80,000 pounds thrust at standard conditions corresponding to 250,000 feet pressure altitude. Variations from the Stage I Titan SM-68 booster will be as follows: An increase in the helium pressurization gas capacity is required as well as possible redesign of the Vernier equipment; addition of pre-valves in the fuel and $LO_2$ lines between the propellant tanks and the main pump inlets will be required as well as structural revisions for increased loads.

The booster interstage structure will require modification and will be lengthened $27\frac{1}{2}$ inches to allow "fire-in-the-hole" staging.

The objective of the booster refinement studies is to determine the structural modification and redesign required for the Titan SM-68 Series J booster to meet the Step I program requirements.

The changes associated with the fire-in-the-hole technique present several problems at this time; poor dove-tailing of the Stage I shutdown and Stage II thrust buildup, addition of blast doors to the interstage and changing interstage design. Methods under study to alleviate the engine problem include spreading out the Stage I thrust decay characteristics, change the engine jacket from dry to wet and a fixed position for the gas generator shuttle valve.

The transition section is the extension of the aft glider fuselage which provides structural and aerodynamic continuity between the glider and booster.

The transition section also serves as a container for the separation engine and various boost and orbital equipment, as well as the subsystem interconnects between the glider and the booster. Included are the mechanisms for a two plane separation system which first separates the combined glider and transition section from the booster and later separates the glider from the transition section.

Basic guidance of the air vehicle during boost is provided by an inertial navigation system located in the glider with radio guidance backup in the transition section. The inertial navigation system provides guidance during the remainder of the flight regime except during landing which normally will be accomplished by the pilot as a manual operation.

The glider selected for the Step I Program is a low wing, delta planform, piloted (one man) vehicle with approximately 330 square feet of wing area, a ground launch weight of approximately 9,300 pounds and a re-entry weight of about 9,200 pounds. The over all length of the glider is 35 feet, 3.8 inches.

Until the completion of the Escape and the Cooled Volume trade studies the current glider configuration as reported in D2-6909 consists of two (2) major components. The forward 15 feet makes up the escape capsule, which may be separated at any point in the flight path returning to earth as a stable unit, and the aft portion which contains all glider equipment except that which functionally must be forward or that which the pilot needs during escape. The equipment container in the aft portion is pressurized and environmentally controlled and contains all the basic electronic and guidance equipment, the flight test equipment, the accessory power unit, and the payload.

The glider structure consists of determinate truss work with a covering of thin-gage corrugation-stiffened skin. The truss work is constructed primarily of Rene '41 nickel base alloy. Insulated skin panels are constructed of a thin-gage outer skin of molybdenum attached to a thin-gage corrugated panel of Rene '41 with insulation material sandwiched between. Uninsulated panels utilize Rene '41 outer skins. The landing gear is an all-skid, uncooled, tricycle-type gear utilizing metal "energy strap" shock absorbers. Main gear skids are of the high-drag wire brush type while the nose skid is a low-coefficient-of-friction type.

The glider is designed to accept with minimum modification, two Rocketdyne AR2-3 liquid rocket engines to accelerate the glider to a Mach number of at least 1.5 and hold for at least 10 seconds after being dropped from a B-52 at 40,000 feet.

The glider secondary power system provides mechanical, hydraulic, electrical, and hot-gas pneumatic (reaction control) power through use of a hydrazine-based monopropellant fuel system and two turbine-driven accessory power units (APU).

The glider environmental control system consists of two separate systems; one for the pilot's compartment, and one for the equipment compartment. An open ended system using an expendable cryogenic (liquid) mixture of oxygen and nitrogen provides pressurization, ventilation, some cooling and a breathable atmosphere for the pilot's compartment. The primary heat sink for internal heat loads is expendable water. The pilot's compartment walls are protected from aerodynamic heat by use of water wicking panels attached to the outer surface of the pressure wall. A redundant atmosphere supply is provided for cooling, pressurization, and a breathable atmosphere for escape system operation. The equipment compartment environmental control system provides cooling and pressurization through use of expendable water and cryogenic nitrogen. Equipment mounted outside pressurized compartments is protected from aerodynamic heat through use of the water wicking principle.

Glider control is derived from aerodynamic control surfaces for flight within the sensible atmosphere. A reaction control system is provided for flight outside the sensible atmosphere. Stability augmentation provides the glider with flying qualities desired by the pilot. Because of the wide range of flight conditions encountered, self-adaptive servos are used. Control of flight is exercised through a side-stick controller which operates the glider aerodynamic controls, the glider reaction controls and the escape capsule reaction controls after separation.

The glider communications system is designed to establish a voice and data link between the vehicle and ground stations within 600 n.m. radius, to provide range safety signals to pertinent equipments and displays within the vehicle and radiate electro-magnetic signals for rescue operations if required on termination of flight. The glider test data acquisition system collects flight safety data, vehicle performance data, military and scientific data. It conditions the data as required and simultaneously stores the data on airborne recorders and transmits it to ground receiving stations.

The flight safety data equipment contains that equipment necessary for acquisition, recording, and transmission of data for real-time monitoring of essential vehicle performance parameters. The flight safety data system has a capacity of 2 continuous FM and 49 sampled PCM channels. A tape recorder located in the capsule records the last 8 minutes of this data prior to capsule separation.

The payload data equipment contains that equipment necessary for acquisition recording and transmission of vehicle performance, military and scientific information. This equipment is flexible and may be expanded using growth packages to meet the varying data requirements of a particular test program. The capacity of this portion of the system is 14 continuous FM channels and from 118 to 955 sampled PCM channels. The recording time capability is 4 hours.

Fire protection will be achieved not by the installation of one overall system designed to suppress fire anywhere, but rather by eliminating the possibility of fire whereever possible. Where the possibility of fire must be considered, fir protection methods will be integrated into the system as feasible and practicable.

On the airdrop glider with the rocket acceleration engine, the fuel system and the engine will be isolated by suitable barriers from the equipment compartments, and a specialized fire detection and extinguishing system will be installed.

All fire protection at the glider design level will be coordinated and monitored by one responsible engineer. In addition, a Fire and Safety Office is being established to maintain surveillance of the fire and safety aspects of the overall Dyna Soar system.

The cockpit is designed to accommodate a 5 to 75 percentile pilot. Physical protection requirements for the pilot are provided through use of a full-body restraint-support system. The system can be adjusted by the pilot for application of restraint for the boost, orbital, re-entry, and escape modes.

The intelligence display consists of inertial flight control, mission management, aerodynamic flight and subsystem displays.

Two types of emergency flight procedures are provided for pilot recovery. These are abort and escape. Abort is defined as the unscheduled departure from the mission wherein the glider and the pilot are recovered. Escape is the abandonment of the basic air vehicle, or glider, and descent of the escape capsule and landing by parachute. Separation from the aft glider section is by use of a solid propellant rocket located low and aft in the capsule. The capsule is designed for landing on land or water. It is designed to float indefinitely on water and pilot provisions are supplied for a 72 hour time period.

A destruct system for the vehicle is provided to comply with range safety requirements. Destruction of the booster is accomplished only after a time delay which assures safe separation of the escape capsule. After the boost phase, the piloted gliders have no provisions for destruction. Unpiloted gliders will carry provisions for destruct after boost.

The abort, escape, and destruct system operation is independent of means of initiation. While the vehicle is on the pad, the Range Safety Officer or the pilot can initiate escape. During first or second stage boost, escape can be initiated by the Range Safety Officer, the pilot, or by automatic means. The pilot only can initiate escape following the boost phase. Abort can be initiated by the pilot only. There are no provisions for abort during first stage boost, except when the vehicle velocity is greater than 5000 fps (about 80,000 ft. altitude).

The Ground Support System for Dyna Soar Step I program includes equipment and facilities at the Seattle Systems Integration Laboratory, the Baltimore Functional Test Area, at AFFTC, AFMTC, the AMR, and associated tracking and monitoring stations. Problems exist in the areas of arresting gear for down range landing sites, RF connectors, checkout and monitor equipment, method of erection of the glider on the booster, and servicing the glider with several types of liquids (particularly cryogenics).

Design development programs have been initiated in the areas of cryogenic servicing and arresting gear for which models and full-scale tests are planned. Studies will be made of the requirements established during the pre-launch checkout and count down.

## SYSTEM TEST PROGRAM

The Systems Development Test Program objective is to acquire, during the Step I program, the data necessary to provide confidence in the adequacy of the piloted Dyna Soar glider for manned global flight. The planning has been based on a program of success. Early manned flight and the acquisition of hypersonic flight data applicable to varying vehicle configurations are also considered primary objectives.

The program is divided into three basic phases. (1) A ground test program at the systems level; (2) A flight program involving air launched gliders at Edwards Air Force Base, and (3) A ground launch test program at the Atlantic Missile Range.

The first phase, the Ground Test Program, consists of glider subsystem integration testing at Seattle, glider/booster compatibility checks at Baltimore and glider/booster assembly, test, and launch complex and range checkout at the AMR.

The second phase, the Air Launch Program at Edwards, involves low speed, transonic and supersonic flight testing using one glider and one B-52 carrier vehicle. The major objectives of this program are to establish the man-machine relationships during low speed flight and landing prior to boosted, piloted flights on the AMR. At the completion of the air launch program, the glider will be re-cycled into the ground launch program.

The third phase, the Ground Launch Program on the AMR, will begin with unmanned flights for the purpose of proof testing the glider/booster configuration, establishing the airworthiness of the glider in hypersonic flight and the adequacy of the escape provisions, and will then progress through a series of piloted flights designed to explore the glider flight characteristics and capabilities and to obtain hypersonic flight data.

Ten gliders will be used to complete the System Development Test Program: one ground test vehicle, and nine complete flight gliders. The nine flight gliders will be used for a total of sixteen (16) ground launched flights. The ground launched flights will include five (5) unmanned and eleven (11) manned flights. The ground launch program will be conducted using one (1) launch pad.

After completion of checkout and acceptance in the Glider System Integration Laboratory at Seattle, the ground test vehicle will be sent to Baltimore for use in system integration, dynamic testing and compatibility testing with the booster and associated ground support equipment. The ground test vehicle will be returned to the System Integration Laboratory at Seattle for sustaining engineering tests.

The second glider produced is scheduled for a four month series of site activation operations and booster/glider captive firings on the pad at the AMR prior to being refurbished and re-cycled for use in the unmanned ground launch program.

The third glider is programmed for the air launch program at Edwards. The fourth glider is the first ground launch glider. The fifth glider will be used in the System Integration Laboratory for glider systems integration and dynamics testing until it is needed for the manned ground launch program.

Of the sixteen flights programmed for ground launch, the five unmanned flights will be launched at a rate of one every two months. The eleven piloted flights will utilize four gliders which will be re-cycled on a schedule of about 6 ½ months to support a launch rate of approximately one every month and a half. The last Step I flight will occur by January 1, 1966, 25 months after the first ground launch.

## TEST AIRCRAFT

Preparation and conduct of the System Development Test Program involve the use of several supporting aircraft to provide an air launch carrier and to aid in subsystem integration, test range checkout, flight operations technique development and general support of flight test operations.

### B-52 Modification and Instrumentation

A B-52 (model to be determined) will be modified for use as the air launch vehicle to drop capsules and launch gliders. Structural modification is required in the bomb bay to allow installation of supporting structure for the capsule and glider.

Instrumentation will be installed in the B-52 to provide adequate monitoring of critical glider components and equipment. Sufficient instrumentation will be included to allow a flight test engineer to assist the glider pilot in preflight functional tests.

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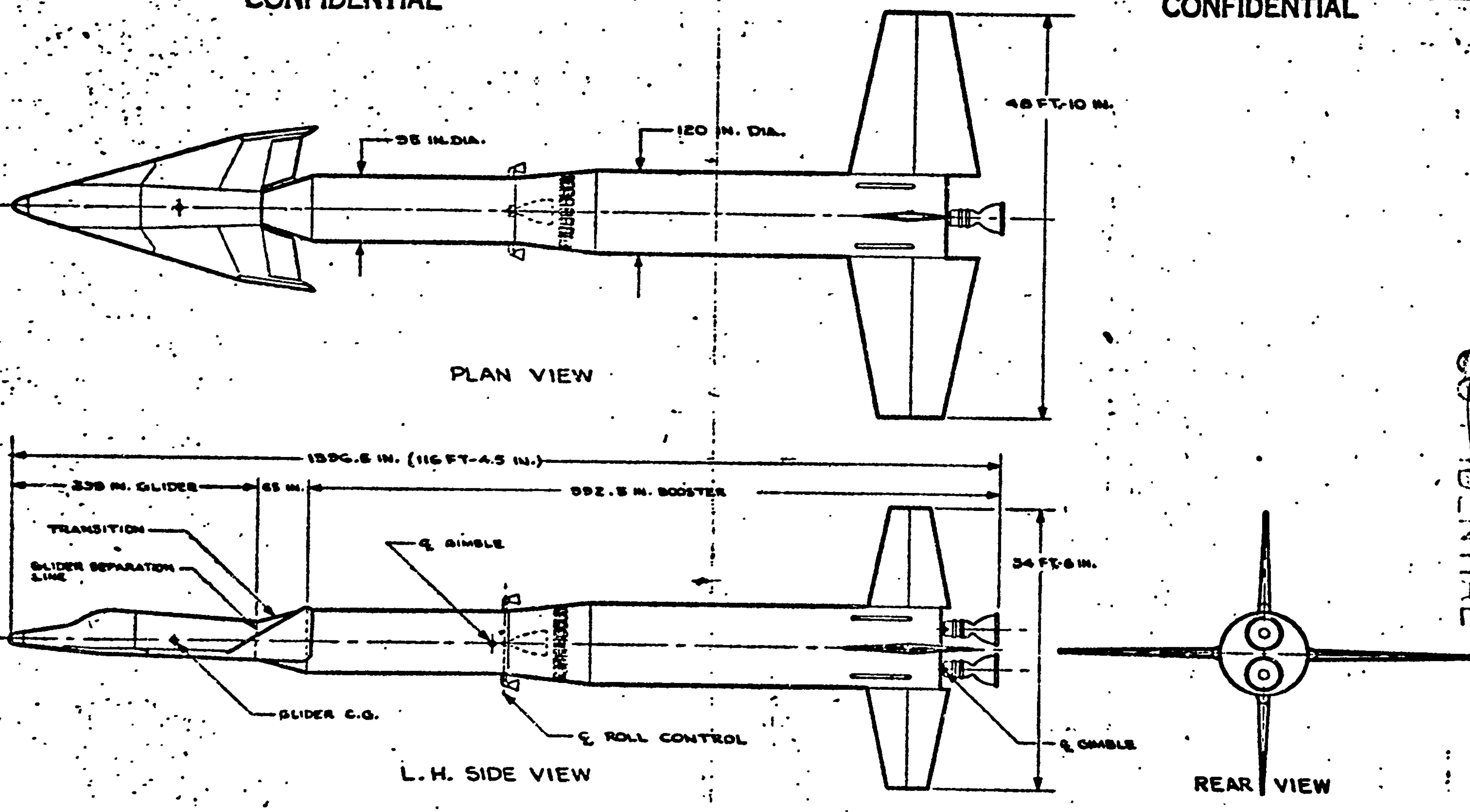


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## SYSTEM OBJECTIVES AND REQUIREMENTS

A. The following design objectives shall apply:

1. A medium L/D Glider, as described by the current approved issue of BAC document D2-6909, shall be used as the starting point for all trade studies to further optimize the system configuration.

2. The Step I Glider shall be readily adaptable, with minor modification, to the Step IIA Program.

3. The data system shall provide the required data from each flight with a maximum loss of 5%.

4. There shall be no significant differences in airborne systems developed for manned and unmanned vehicles on those items critical to performance and safety.

5. The glider shall be capable of at least four (4) flights experiencing the most severe conditions in the equilibrium flight corridor with minor refurbishment.

6. The glider shall be capable of landing at a field displaced no less than 700 nautical miles laterally from the insertion path when the turn is initiated at 19,000 fps relative velocity.

7. The pilot and equipment compartment(s) structure and seals will be designed for zero leakage.

8. The glider shall be capable of a safe flight corridor depth of no less than 30,000 feet for equilibrium glide between maximum usable $C_L$ and minimum safe $C_L$ between 5,000 fps and near orbital velocity.

9. The Step I air drop glider shall be capable of accelerating to Mach 2.0 at the optimum altitude after being dropped from a B-52.

10. The glider shall demonstrate, at approximately 19,000 fps, a maximum $C_L$ of 0.69, trimmed, and a maximum L/D within the range of 1.5 to 2.5.

11. The air-launch test data acquisition airborne system will have flexibility to acquire up to approximately 300 measurements. The ground-launch test data acquisition airborne system will have flexibility to acquire up to approximately 700 measurements.

12. The glider shall be controllable throughout the flight regime, by the pilot, with both guidance and stability augmentation systems inoperable.

B. The following design requirements will establish a test system capable of developing the technology required to exploit the inherent potential of atmosphere for military weapon systems operation in the hypersonic and orbital flight regime.

1. The booster shall be a modified version of the SM 68 Titan ICBM.

2. The glider shall be capable of a safe manually controlled tangential landing on an 8,000 ft. by 150 ft. landing strip without the use of a landing engine. The use of an arresting mechanism shall be allowable.

3. The glider shall be designed to have an hypersonic $C_L$ maximum no less than 0.60 at approximately 19,000 fps at the equilibrium glide altitude and an L/D no less than 1.5. The material application selected must insure the structural integrity throughout

the entire boost and glide regime.

4. The Step I glider external configuration and basic airframe shall have sufficient volume to meet the stores requirements of a "twice-around" flight plus 5 minutes pre-launch time. Mission flight time from launch to touch down for the "twice-around" mission shall be approximately 214 minutes.

5. The flight control system shall be capable of automatic and manual control. The manual control system shall be capable of operating:

   a. With the guidance and stability augmentation system inoperative.

   b. As an over-ride over automatic control.

6. The glider shall be designed to accommodate pilot sizes through the range from the 5 to the 75th percentile man as defined by WADC Training Report #52321; Anthropology of Flight Personnel dated September 1954, with the pilot wearing a full pressure suit inflated. The pilot's weight to be utilized in calculating performance data will be based on that of a 50 percentile man.

7. The test data system shall employ telemetry technique and onboard recording in a retrievable package. This system includes approximately 50 channels of data used for safety monitoring purposes not considered as part of the design payload.

8. The design shall provide for two-way voice radio communication between the pilot and ground stations. Communication between pilot and ground stations will not necessarily be continuous.

9. The design shall provide accommodations for Step IIA with minimum configuration change. Glider design efforts shall insure this requirement through appropriate correlation with Step IIA planning being accomplished as a separate effort.

10. The glider payload shall be not less than 1000 pounds; at least 75 cubic feet of usable volume shall be provided.

11. The glider shall attain a relative velocity at boost burnout of at least 19,000 fps provided the performance characteristics of the SM 68 Titan booster meets the performance requirements of BAC document D2-5338.

12. As part of the basic weight, atmosphere supply shall be provided to allow a maximum leakage rate of .25 pounds per minute for the pilot's compartment and a leakage rate of .25 pounds per minute for the basic equipment compartment.

## PROGRAM ELEMENTS

This section contains a breakdown of the Program Elements of the Dyna Soar program and a definition of each of the sub area elements.

The program elements outline the constituent activities of the Dyna Soar program as identified by a joint System Contractor/Air Force effort. Each level defines the component activities of the program in successively greater detail identifying the activities required to accomplish the program. The total Dyna Soar program consists of three segments; Step I and IIA, Step II and Step III. The joint Air Force/System Contractor effort defined all program elements through the Subsystem or Project (level 4) elements, with some Component or Task elements (level 5) being identified. By applying the Dewey Decimal System as well as naming the levels of detail, a dual method of identifying the programs was obtained; for example, the level 4 element (Booster) Secondary Power may also be identified as Element 1.1.2.3. Thus the program element breakdown provides both contractor and government with a management tool by which segments of the program can be effectively identified for planning, reporting, and control.

The activities required to provide the program elements identified in each sub area (level 3) element are outlined in a section titled "Definitions" which follows the element breakdown. This includes such activities as development, design, procurement, manufacture and testing. The definitions do not assign the responsibility for performance of these activities. These responsibilities may be determined from System and Associate Contractor Statements of Work and contractors' "Make-or-Buy" plans.

# DYNA SOAR PROGRAM ELEMENTS



| LEVEL 2<br>AREA | LEVEL 3<br>SUB AREA | LEVEL 4<br>SUBSYSTEM OR PRO |
|---|---|---|
| AIR VEHICLE | 1. GLIDER | 1. AIRFRAME<br>2. PROPULSION<br>3. SECONDARY POWER<br>4. ENVIRONMENTAL CONTROL<br>5. FIRE PROTECTION & SAFETY SUBSYSTEM<br>6. CREW STATION<br>7. CREW ESCAPE<br>8. PERSONNEL PROTECTION<br>9. TRANS[illegible]<br>10. GLIDER INTEGRATION |
| | 2. BOOSTER | 1. AIRFRAME<br>2. PROPULSION<br>3. SECONDARY POWER<br>4. FIRE PROTECTION & SAFETY SUBSYSTEM<br>5. [illegible] |
| | 3. AVIONICS | 1. GLIDER PRIMARY & SEC. FLIGHT CONTROL<br>2. BOOSTER FLIGHT CONTROL<br>3. PRIMARY VEHICLE GUIDANCE<br>4. RADIO GUIDANCE BACKUP<br>5. GLIDER FLIGHT INSTRUMENTATION<br>6. COMMUNICATION & TRACKING<br>7. ANTENNAS, WINDOWS & FEEDLINES<br>8. AVIONICS INTEGRATION |
| | 4. AIRBORNE DATA COLLECTION | 1. GLIDER INSTRUMENTATION<br>2. BOOSTER INSTRUMENTATION<br>3. GEOPHYSICAL & ASTROPHYSICAL INSTRUME<br>4. PROPAGATION INSTR.<br>5. MILITARY EQUIPMENT INSTRUMENTATION<br>6. AIRBORNE DATA COLLECTION INTEGRATIO<br>7.<br>8.<br>9. |
| | 5. MILITARY EQUIPMENT | 1. TERMINAL GUIDANCE<br>2. BOMB-NAVIGATION-RADAR<br>3. RECONNAISSANCE RADAR<br>4. RECONNAISSANCE INFRARED<br>5. RECONNAISSANCE PHOTOGRAPHIC<br>6. ELECTRONIC INTELLIGENCE<br>7. ADVANCED [illegible]ORM<br>8. TEST ASM & [illegible] EQUIPMENT<br>9. RADAR [illegible]<br>10. [illegible]<br>[illegible] |

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| | | |
|---|---|---|
| | 6. AIR VEHICLE INTEGRATION | 1. AIR VEHICLE DESIGN<br>2. ASSEMBLY & EVALUATION TESTS |
| G S E & FACILITIES | 1. GLIDER G S E | 1. HANDLING & TRANSPORTATION EQUIP.<br>2. SERVICING & ENVIRONMENTAL EQUIP.<br>3. MAINTENANCE & TEST EQUIP.<br>4. GROUND CHECKOUT EQUIP.<br>5. GLIDER GSE INTEGRATION |
| | 2. BOOSTER G S E | 1. HANDLING & TRANSPORT EQUIP.<br>2. SERVICING & ENVIRONMENTAL EQUIP.<br>3. MAINTENANCE & TEST EQUIP.<br>4. GROUND CHECKOUT EQUIP.<br>5. BOOSTER GSE INTEGRATION |
| | 3. BASE & RANGE G S E | 1. B-52 GLIDER GSE<br>2. LAUNCH SUPPORT EQUIPMENT<br>3. COMMUN. & TRACKING EQUIP GSE<br>4. GUIDANCE EQUIP. GSE<br>5. RANGE SAFETY EQUIP. GSE<br>6. TELEMETRY STATION GSE<br>7. LANDING SITE GSE<br>8. BASE & RANGE GSE INTEGRATION |
| | 4. TRAINING EQUIP. | 1. PILOT TRAINING AIDS & EQUIPMENT<br>2. GROUND CREW TRAINING AIDS & EQUIPMENT<br>3. TRAINING EQUIPMENT INTEGRATION |
| | 5. INDUS. FACILITIES | 1. GLIDER INDUSTRIAL FACILITIES<br>2. GLIDER CATEGORY I TEST FACILITIES<br>3. BOOSTER INDUSTRIAL FACILITIES<br>4. BOOSTER CATEGORY I TEST FACILITIES<br>5. GLIDER BOOSTER CAT. I TEST FACILITIES |
| | 6. TEST SITE FACILITIES | 1. AFFTC FACILITIES<br>2. PATRICK AFB FACILITIE<br>3. [illegible] LAUNCH FACILITIES<br>4. TELEMETRY STATION [illegible]ITIES<br>5. LANDING SITE FACILITIES<br>6. TEST SITE FACILITIES INTEGRATION |
| | 7. G S E & FACIL. INTEGRATION | 1.<br>2<br>3 |
| SYSTEM DEVELOPMENT TEST | 1. TEST AIRCRAFT | 1. B-52 CARRIER MODIFICATION & INSTRUMENT.<br>2 SUPPORT AIRCRAFT MODIFICATION & INSTR.<br>3. TEST AIRCRAFT INTEGRATION |
| | 2. AIR LAUNCH TEST SUPPORT & RANGE ACTIVATION | 1. DATA ACQUISITION EQUIPMENT<br>2 COMMUNICATIONS & TRACKING EQUIPMENT<br>3. TEST CONTROL CENTER<br>4. BASE SERVICES & EQUIP.<br>5. AIR LAUNCH TEST SUPPORT INTEGRATION |
| | 3. GROUND LAUNCH TEST SUPPORT & RANGE ACTIVATION | 1. DATA ACQUISITION EQUIPMENT<br>2. COMMUNICATIONS & TRACKING EQUIPMENT<br>3. TEST CONTROL CENTERS<br>4. BASE SERVICES & EQUIP.<br>5. GUIDANCE EQUIPMENT<br>6. DOWN RANGE LANDING SITES<br>7. RANGE SAFETY<br>8. SEARCH RECOVERY AND CR RESCUE<br>9. SHIPS<br>10 GROUND LAUNCH TEST SUPPORT INTEGR. |
| | 4. AIR LAUNCH OPERATIONS | 1. PREPARATION & PLAN[illegible]<br>2. TEST COND[illegible]<br>3. [illegible] |
| | 5. [illegible] GROUND | 1. PREPARATION & PLANNING |

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| | | |
|---|---|---|
| | 7. G S E & FACIL. INTEGRATION | 1.<br>2.<br>3. |
| SYSTEM DEVELOPMENT TEST | 1. TEST AIRCRAFT | 1. B-52 CARRIER MODIFICATION & INSTRUMENT.<br>2. SUPPORT AIRCRAFT MODIFICATION & INSTR.<br>3. TEST AIRCRAFT INTEGRATION |
| | 2. AIR LAUNCH TEST SUPPORT & RANGE ACTIVATION | 1. DATA ACQUISITION EQUIPMENT<br>2. COMMUNICATIONS & TRACKING EQUIPMENT<br>3. TEST CONTROL CENTER<br>4. BASE SERVICES & EQUIP.<br>5. AIR LAUNCH TEST SUPPORT INTEGRATION |
| | 3. GROUND LAUNCH TEST SUPPORT & RANGE ACTIVATION | 1. DATA ACQUISITION EQUIPMENT<br>2. COMMUNICATIONS & TRACKING EQUIPMENT<br>3. TEST CONTROL CENTERS<br>4. BASE SERVICES & EQUIP.<br>5. GUIDANCE EQUIPMENT<br>6. DOWN RANGE LANDING SITES<br>7. RANGE SAFETY<br>8. SEARCH, RECOVERY AND OR RESCUE<br>9. SHIPS<br>10. GROUND LAUNCH TEST SUPPORT INTEGR. |
| | 4. AIR LAUNCH OPERATIONS | 1. PREPARATION & PLANNING<br>2. TEST CONDUCT<br>3. ANALYSIS & REPORTING |
| | 5. UNMANNED GROUND LAUNCH OPERATIONS | 1. PREPARATION & PLANNING<br>2. TEST CONDUCT<br>3. ANALYSIS & REPORTING |
| | 6. MANNED GROUND LAUNCH OPERATIONS | 1. PREPARATION & PLANNING<br>2. TEST CONDUCT<br>3. ANALYSIS & REPORTING |
| | 7. SYST. DEV. TEST INTEGR. | 1.<br>2.<br>3 |
| PROGRAM MANAGEMENT & SUPPORT | 1. LOGISTICS | 1. LOGISTIC SUPPORT MANAGEMENT<br>2 SUPPLY SUPPORT<br>3. BASE & ANCILLARY EQUIPMENT MAINTEN.<br>4. TRANSPORTATION<br>5 TRAINING (GROUND PERSONNEL)<br>6. LOGISTICS INTEGRATION |
| | 2. SUPPORT | 1. DEI'S<br>2 MOCKUP INSPECTION<br>3. CTCI S<br>4. SAFETY OF FLIGHT INSPECTION<br>5. SYMPOSIA |
| | 3. PLANNING & REPORTING | 1. PROGRAM PLAN<br>2. REPORTING<br>3 PEP SYSTEM |
| | 4. STEP IIA PLANNING & ANALYSIS | 1. GLIDER<br>2 BOOSTER<br>3. AVIONICS<br>4. GSE & FACILITIES<br>5. MILITARY APPLICATIONS<br>6. TEST PROGRAMS<br>7. STEP IIA INTEGRATION |
| YSTEM INTEGRATION | 1. SYSTEM INTEGRATION | 1. TECHNICAL INTEGRATION<br>2. SYSTEM REQUIREMENTS<br>3. SYSTEM ANALYSIS<br>4. SYSTEM TRADE STUDIES<br>5. RELIABILITY<br>6. MAINTAINABILITY<br>7. FIRE PROTECTION & SAFETY PROGRAM<br>8 HUMAN FACTORS<br>9.<br>10 |
| | 1. | |

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| | | |
|---|---|---|
| [illegible] DEVELOPMENT TEST | [illegible] LAUNCH/TEST SUPPORT & RANGE ACTIVATION | 7. [illegible]<br>8. [illegible]<br>9. [illegible]<br>10. [illegible] TEST SUPPORT INTEGR. |
| | 4. AIR LAUNCH OPERATIONS | 1. PREPARATION & PLANNING<br>2. TEST CONDUCT<br>3. ANALYSIS & REPORTING |
| | 5. UNMANNED GROUND LAUNCHOPERATIONS | 1. PREPARATION & PLANNING<br>2. TEST CONDUCT<br>3. ANALYSIS & REPORTING |
| | 6. MANNED GROUND LAUNCH OPERATIONS | 1. PREPARATION & PLANNING<br>2. TEST CONDUCT<br>3. ANALYSIS & REPORTING |
| | 7. SYST. DEV. TEST INTEGR. | 1.<br>2.<br>3 |
| PROGRAM MANAGEMENT & SUPPORT | 1. LOGISTICS | 1. LOGISTIC SUPPORT MANAGEMENT<br>2 SUPPLY SUPPORT<br>3. BASE & ANCILLARY EQUIPMENT MAINTEN.<br>4. TRANSPORTATION<br>5 TRAINING (GROUND PERSONNEL)<br>6. LOGISTICS INTEGRATION |
| | 2. SUPPORT | 1. DEI'S<br>2 MOCKUP INSPECTION<br>3. CTCI'S<br>4 SAFETY OF FLIGHT INSPECTION<br>5. SYMPOSIA |
| | 3. PLANNING & REPORTING | 1. PROGRAM PLAN<br>2. REPORTING<br>3 PEP SYSTEM |
| | 4. STEP IIA PLANNING & ANALYSIS | 1. GLIDER<br>2 BOOSTER<br>3. AVIONICS<br>4. GSE & FACILITIES<br>5. MILITARY APPLICATIONS<br>6. TEST PROGRAMS<br>7 STEP IIA INTEGRATION |
| SYSTEM INTEGRATION | 1. SYSTEM INTEGRATION | 1. TECHNICAL INTEGRATION<br>2. SYSTEM REQUIREMENTS<br>3. SYSTEM ANALYSIS<br>4. SYSTEM TRADE STUDIES<br>5. RELIABILITY<br>6. MAINTAINABILITY<br>7. FIRE PROTECTION & SAFETY PROGRAM<br>8 HUMAN FACTORS<br>9.<br>10. |
| WEAPON SYSTEM STUDIES | 1. STEP IIB STUDIES | 1.<br>2.<br>3.<br>4.<br>5. |
| WEAPON SYSTEM STUDIES | 1. | |

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## PROGRAM ELEMENT DEFINITIONS

The following are outlines of the work content of each of the level 3 Dyna Soar (Step I) Program Elements.

1.1.1 Glider - This element includes the following tasks:

a. Engineering design, procurement of materials, subcontract program and manufacture of: glider airframe, glider propulsion, secondary power, environment control, fire protection, crew station, crew escape, personnel protection, all test articles including special tools and test equipment.

b. Design and manufacture of glider mockup articles.

c. Engineering design, procurement and manufacture of the glider/booster transition section including special tools and test equipment.

d. Final assembly of the glider including installation of avionics, airborne instrumentation, military equipment and transition assembly. It includes all installations in the test articles.

e. All design development test programs and development programs including test and prototype hardware required to support engineering design and manufacturing operations for the glider and/or transition section (capsule tests, sled tests, hets shots, static test, qualification and functional tests).

f. System Integration Laboratory design development activities connected with the Static Test Glider, Ground Test Glider, Site Activation Glider, and the glider used for subsystem integration.

g. Re-cycle of gliders through the manufacturing shops following flight test of the glider.

h. Activity is complete upon delivery of glider on dock at the using facility for system development testing.

1.1.2 Booster - This element includes the following tasks:

a. Engineering design, procurement of materials, subcontract program and manufacture of: booster airframe, propulsion, fire protection, secondary power test articles including special tools and test equipment.

b. Design and manufacture of booster mockup articles.

1.1.2 Booster (Cont.)

c. Final assembly including installation of all avionics and airborne instrumentation.

d. System integration laboratory activites for booster.

e. All design development tests and development programs including test and prototype hardware required to support engineering design and manufacturing operations for the booster.

f. Re-cycle of captive firing boosters.

g. Activity is complete upon delivery of the booster on dock at the using facility for system development testing.

1.1.3 Avionics - This element includes the following tasks:

a. The engineering design, procurement and manufacture of the following: glider primary and secondary flight control, booster flight control, primary vehicle guidance, radio guidance backup, glider display instrumentation, vehicle mission and traffic control, antennae, windows and feedlines, special tools and test equipment.

b. All design development testing, simulations and developmental programs include test and prototype hardware required to support engineering design and manufacture of the avionic subsystems and components.

c. Activity is complete at the time that avionics are complete and ready for installation in the air vehicle.

1.1.4 Airborne Data Collection - This element includes the following tasks:

a. The engineering design, procurement, and manufacture of the following: glider instrumentation, booster instrumentation, geophysical and astrophysical instrumentation, propagation instrumentation and military equipment instrumentation, special tools and test equipment.

b. All design development testing, simulations and developmental programs including test and prototype hardware required to support engineering design and manufacture of the data collection systems and components.

c. Activity is complete at time that data collection instrumentation is ready for installation in the air vehicle.

1.1.5 Military Equipment - This element indudes the following tasks:

a. Engineering studies for the required integration of vehicle subsystems and airframe to provide for the following military equipment: terminal guidance radar, bomb-navigation radar, reconnaissance radar, reconnaissance infrared, reconnaissance photographic, electronic intelligence, advanced platform, test ASM and ejection equipment, radar altimeter, maneuvering enginerand military equipment integration.

b. Engineering design, procurement and manufacture of military equipment including special tools and test equipment.

c. All design development testing, simulations and development programs including test and prototype hardware required to support engineering design and manufacture of the military equipments.

d. This activity is complete at the time the equipment is available for installation in the air vehicle.

1.1.6 Air Vehicle Integration - This element includes the following tasks:

a. Engineering design relating to the total air vehicle.

b. All design development testing and developmental programs relevant to the glider/booster integration including compatibility, dynamic and captive firing tests.

c. This task is complete at the time the glider and booster captive firing tests are completed.

1.2.1 Glider GSE - This element includes the following tasks:

a. The determination of requirements, engineering design, procurement and manufacture of the following glider GSE; handling and transportation equipment, servicing and environmental equipment, maintenance and test equipment and ground checkout equipment.

b. All design development testing and developmental programs including test and prototype hardware as required to support engineering and manufacturing operations for glider GSE.

c. Design and manufacture of mockup articles.

d. This task is complete at the time that glider GSE is on dock at the using facility.

1.2.2 Booster GSE - This element includes the following tasks:

a. The determination of requirements, engineering design, procurement and manufacture of the following booster GSE; handling and transport equipment, servicing and environmental equipment, maintenance and test equipment and ground checkout equipment.

b. All design development testing and developmental programs including test and prototype hardware as required to support engineering and manufacturing operations for booster GSE.

c. Design and manufacture of mockup articles.

d. This task is complete at the time that booster GSE is on-dock at the using facility.

1.2.3 Base and Range GSE - This element includes the following tasks:

a. The determination of requirements, engineering design, procurement and manufacture of the following base and range GSE: B-52/glider GSE, launch support equipment, communication and tracking equipment GSE, guidance equipment, range safety equipment GSE, telemetry station GSE and landing sites GSE, as required to support engineering and manufacturing operations for Base and Range GSE.

c. Design and manufacture of mockup articles.

d. This task is complete at the time that Base and Range GSE is on-dock at the using facility.

1.2.4 Training Equipment - This element includes the following tasks:

a. Engineering design, procurement, manufacture and installation of: pilot training aids and equipment, ground crew training aids (if any) and equipment.

b. Integration of training equipment.

c. This task is complete at the time that training aids and equipment are delivered at the using facility.

1.2.5 Industrial Facilities - This element includes the following tasks:

a. The determination of requirements for industrial facilities, machinery and equipment located within the contractor, associate contractor and subcontractor complexes as required to support the manufacture, maintenance and design development testing of the glider, the booster and the glider/booster.

1.2.5 Industrial Facilities (Cont.)

b. Design and contruction of brick and mortar within the contractor, associate contractor and subcontractor complexes.

c. Procurement, re-arrangement and installation, calibration and check-out of industrial equipment and GSE within the industrial facilities in the contractor, associate contractor and subcontractor complexes.

d. This task is complete at the activation date (completion of IC &C).

1.2.6 Test Site Facilities - This element includes the following tasks:

a. The determination of requirements for brick and mortar, facilities equipment and support areas at AFFTC, Patrick AFB, Cape Canaveral Support and Launch Areas, telemetry stations and landing sites.

b. The acquisition and A&E design and construction of brick and mortar at all test sites.

c. Procurement, rearrangement and installation; calibration and checkout of GFE (Facilities type).

d. The integration of facilities at all test sites.

e. The task is complete at the beneficial occupancy date (BOD).

1.2.7 GSE & Facilities Integration - This element includes the following tasks:

a. The integration of GSE and the planning for the integration of GSE facilities.

1.3.1 Test Aircraft - This element includes the following tasks:

a. Determination of test aircraft requirements and arrangement for the assignment of test aircraft to the Dyna Soar Program.

b. Design engineering, procurement of material, manufacture and modification of the test aircraft including installation of instrumentation.

c. This task is complete at the time the test aircraft modifications are complete to support the range test and flight test program.

1.3.2 Air Launch Test Support & Range Activation - This element includes the following tasks:

a. Determination of air launch data acquisition requirements and subsequent engineering design, material procurement, sub-

1.3.2. Air Launch Test Support & Range Activation (Cont)

contract and manufacture, including special tooling and test equipment. This task does not include the airborne date acquisition equipment and instrumentation.

b. The determination of requirements for communications and tracking equipment, test control center and base services & equipment. The design, procurement and manufacture of this equipment.

c. All design development testing and developmental programs including test and prototype hardware required to support "a" and "b" above.

d. The integration of all air launch test support and equipment.

e. The installation, calibration and check-out of all air launch GSE and test support equipment at AFFTC.

f. This task is complete at the time that all air launch GSE & Test support equipment is checked out and is available for use in support of the air launch operations.

1.3.3 Ground Launch Test Support and Range Activation - This element includes the following tasks:

a. The determination of ground launch data acquisition requirement and the subsequent engineering design. material procurement, subcontract and manufacture including special tooling and test equipment. This task does not include the airborne data acquisition equipment and instrumentation.

b. The determination of requirements for communications and tracking equipment, test control centers, base services and equipment, guidance equipment. down-range landing sites, range safety, search, recovery and/or rescue and ships.

c. The engineering design, material procurement, subcontract and manufacture including special tooling and test equipment of equipment outlined in (b) above.

d. All design development testing and developmental programs including test and prototype hardware required to support "a" and "c" above.

e. The integration of all ground launch test support equipment.

f. The installations, calibration of all ground launch GSE and test support equipment at assembly and test launch site, telemetry

1.3.3 Ground Launch Test Support and Range Activation (Cont.)

stations and landing sites.

g. This task is complete at the time that all ground launch GSE and test support equipment located at all test sites, control centers, aircraft and ships have been checked out and are available for use in support of the ground launch operations.

1.3.4 Air Launch Operations - This element includes the following tasks:

a. Development of the air launch system test plan.
b. System Integration Laboratory activities for air launch gliders.
c. The glider air launch tests, data acquisition and analysis of test [illegible]te.
d. Maintenance and operation of test equipment and instrumentation as required to support the air launch program.
e. Maintenance of glider and test aircraft.
f. Task is complete at time last test report is submitted to WSPO.

1.3.5 Unmanned Ground Launch Operations - This element includes the following tasks:

a. Develop the unmanned ground launch system test plan.
b. System Integration Laboratory activities on unmanned ground launch gliders & boosters.
c. The assembly and test work on the glider and booster at Cape Canaveral, the preflight checkout of the glider/booster systems.
d. The unmanned ground launch flight tests, monitoring of flight, data acquisition and subsequent analysis of the test data.
e. Maintenance and operation of all test equipment and instrumentation as required to support the ground launch tests.
f. Task is complete at time last unmanned flight test report is submitted to WSPO.

1.3.6 Manned Ground Launch Operations - This element includes the following tasks.

a. Development of the manned ground launch system test plan.
b. System Integration Laboratory activities on manned ground launch gliders & boosters.
c. The assembly and test work on the glider and booster at Cape canaveral and the preflight checkout of the glider/booster systems.

1.3.6 Manned Ground Launch Operations (Cont.)

d. The manned ground launch tests, the monitoring of the flights, date acquisition and subsequent analysis of the test date.

e. Maintenance and operation of all test equipment and instrumentation as required to support the ground launch tests.

f. The task is complete at the time the last test report on the manned flight tests is submitted to WSPO.

1.3.7 System Development Test Integration - This element includes the following task:

a. Develop the system development test plan integrating the requirements of the air launch program, unmanned ground launch program and manned ground launch program.

1.4.1 Logistics - This element includes the following tasks:

a. The planning for and provisioning of spares peculiar to the Dyna Soar (Step I) Program.

b. Determination of the GFP and government furnished GSE requirements for air and ground launch operations.

c. The planning for and providing of maintenance of base and ancillary equipment.

d. The determination of and arrangements for total Dyna Soar (Step I) Program transportation requirements.

e. Planning and performing the ground personnel training.

f. Integration of all logistics, maintenance and training activities.

1.4.2 Support - This element includes the following tasks:

a. All activities relating to the production of DEI's, CTCI's, mockup inspections, safety-of-flight inspections and Symposia. This element does not include the engineering or manufacturing effort expended in producing the mockup articles.

1.4.3 Planning and Reporting - This element includes the following tasks:

a. All activities devoted to producing and maintaining the Dyna Soar (Step I) Program Plan.

b. All program progress reporting activities including Motion Picture activities.

c. The activities required to institute and maintain the PEP system.

1.4.4 Step IIA Planning and Analysis - This element includes the following tasks:

a. All planning activities related to the Dyna Soar (Step IIA) Program.

1.5.1 System Integration - This element contains the following tasks

a. Coordination of all development and design efforts to ensure compatibility of the entire Dyna Soar (Step I) System. This includes record and control procedure establishment, interface control, system configuration control and change incorporation.

b. Development of system design requirements.

c. Analysis of the capability of the system to meet design objectives.

d. System trade studies.

e. Establishment and maintenance of a system reliability program.

f. Development of a maintainability program.

g. Development and surveillance of a system Fire Protection and Safety Program.

h. Establishment and coordination of a Human Factors program for the Dyna Soar (Step I) system.

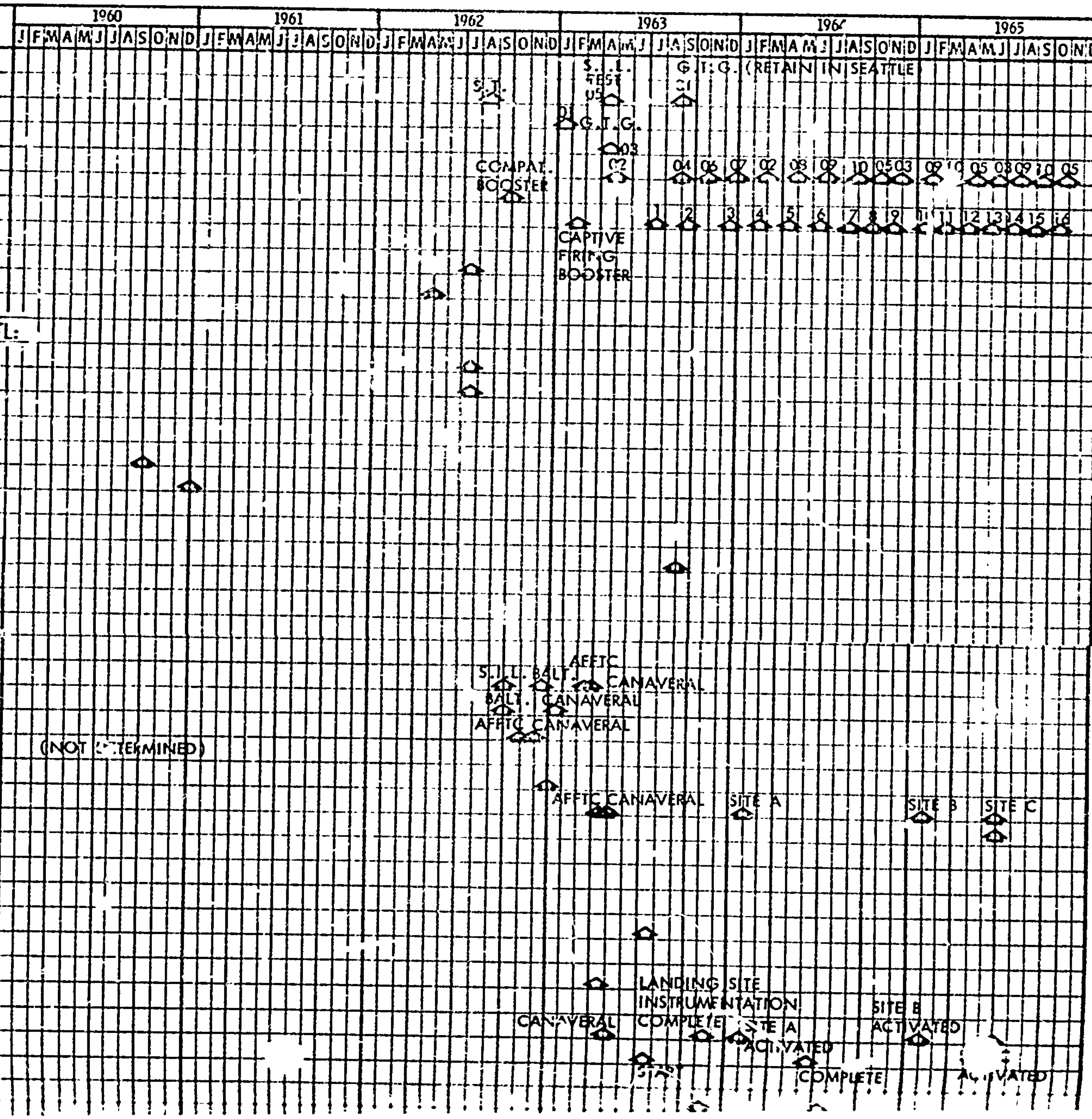
MASTER PHASING CHART 1.0

# MILITARY TEST SYSTEM

DYNA SOAR STEP 1

BOEING-AF 33(600)-41517

1 AIR VEHICLE
2 GLIDER AVAILABLE: SEATTLE
3 BALTIMORE
4 AFFTC
5 CANAVERAL
6 BOOSTER AVAILABLE: BALTIMORE
7 CANAVERAL
8
9 AVIONICS EQUIP. AVAIL. FOR INSTL.: GLIDER
10 BOOSTER
11
12 AIRBORNE DATA COLLECT. EQUIP. AVAIL. FOR INSTL.:
13 GLIDER
14 BOOSTER
15
16 MILITARY EQUIPMENT:
17 DEFINITION OF SUBSYSTEMS
18 INSTAL. ACCOM. DETERMINED
19
20 AIR VEHICLE INTEGRATION:
21 AIR VEHICLE INTEGRATION COMP
22
23
24
25 GSE & FACILITIES
26 GLIDER GSE AVAILABLE
27 BOOSTER GSE AVAILABLE
28 BASE & RANGE GSE AVAILABLE
29 TRAINING EQUIPMENT AVAILABLE
30 INDUSTRIAL FACILITIES COMPLETE
31 TEST SITE FACILITIES COMPLETE
32 INTEGRATION COMPLETE
33
34
35 SYSTEM DEVELOPMENT TEST
36 TEST AIRCRAFT MOD. & AVAILABLE
37 AIR LAUNCH TEST SUPPORT AVAIL. &
38 RANGE ACTIVATION COMPLETE
39 GROUND LAUNCH TEST SUPPORT AVAIL. & RANGE
40 ACTIVATION COMPLETE
41 AIR LAUNCH OPERATIONS (TOTAL)
42 UNMAN GROUND LAUNCH OPERATIONS:
43 LAUNCHES (TOTAL)
44 MANNED GROUND LAUNCH OPERATIONS:



... GROUND LAUNCH OPERATIONS:

| | |
|---|---|
| 45 | LAUNCHES (TOTAL) |
| 46 | INTEGRATION COMPLETE |
| 47 | |
| 48 | |
| 49 | PROGRAM MANAGEMENT & SUPPORT |
| 50 | LOGISTICS: |
| 51 | SPARES AVAILABLE |
| 52 | SUPPORT: |
| 53 | DESIGN ENGINEERING INSPECTION |
| 54 | MOCK-UP INSPECTION (SEATTLE) |
| 55 | C.T.C.I'S |
| 56 | SAFETY OF FLIGHT INSPECTION |
| 57 | SYMPOSIUM |
| 58 | PLANNING & REPORTING: |
| 59 | PROGRAM GO-AHEAD |
| 60 | WORK STATEMENT FROM A.F. FOR |
| 61 | BAC REVIEW |
| 62 | PROGRAM PLAN COMPLETE - TO AIR FORCE |
| 63 | COST PROPOSAL SUBMITTAL (BAC) |
| 64 | |
| 65 | CONTRACT DEFINITIZATION |
| 66 | FINAL MANAGEMENT REPORT COMPLETE |
| 67 | STEP IIA PLANNING & ANALYSIS STARTS |
| 68 | |
| 69 | |
| 70 | SYSTEM INTEGRATION |
| 71 | DESIGN REFINEMENT SYSTEM DESCRIPTION COMP. |

START COMPLETE

START COMP.

COMPLETE 3-1-66

CANAVERAL (BOOSTER)

AFFTC (GLIDER)

CANAVERAL (GLIDER)

BOOSTER GLIDER

1ST INCREMENT 2ND INCREMENT 3RD INCREMENT 4TH INCREMENT 5TH INCREMENT 6TH INCREMENT

(NOT DEFINED IN STATEMENT OF WORK)

3-3

PRELIM INTERIM COMPLETE

LEGEND

GLIDER

ST = STATIC TEST ARTICLE

GTG = GROUND TEST GLIDER

01, 02, 03 ETC. = MFG. UNIT NUMBER

SIL = SYSTEMS INTEGRATION LABORATORY

BOOSTER

1, 2, 3, ETC. = LAUNCH UNIT NUMBERS

| 1960 | 1961 | 1962 | 1963 | 1964 | 1965 |
|---|---|---|---|---|---|
| J F M A M J J A S O N D | J F M A M J J A S O N D | J F M A M J J A S O N D | J F M A M J J A S O N D | J F M A M J J A S O N D | J F M A M J J A S O N D |

D2-5697

4C.14

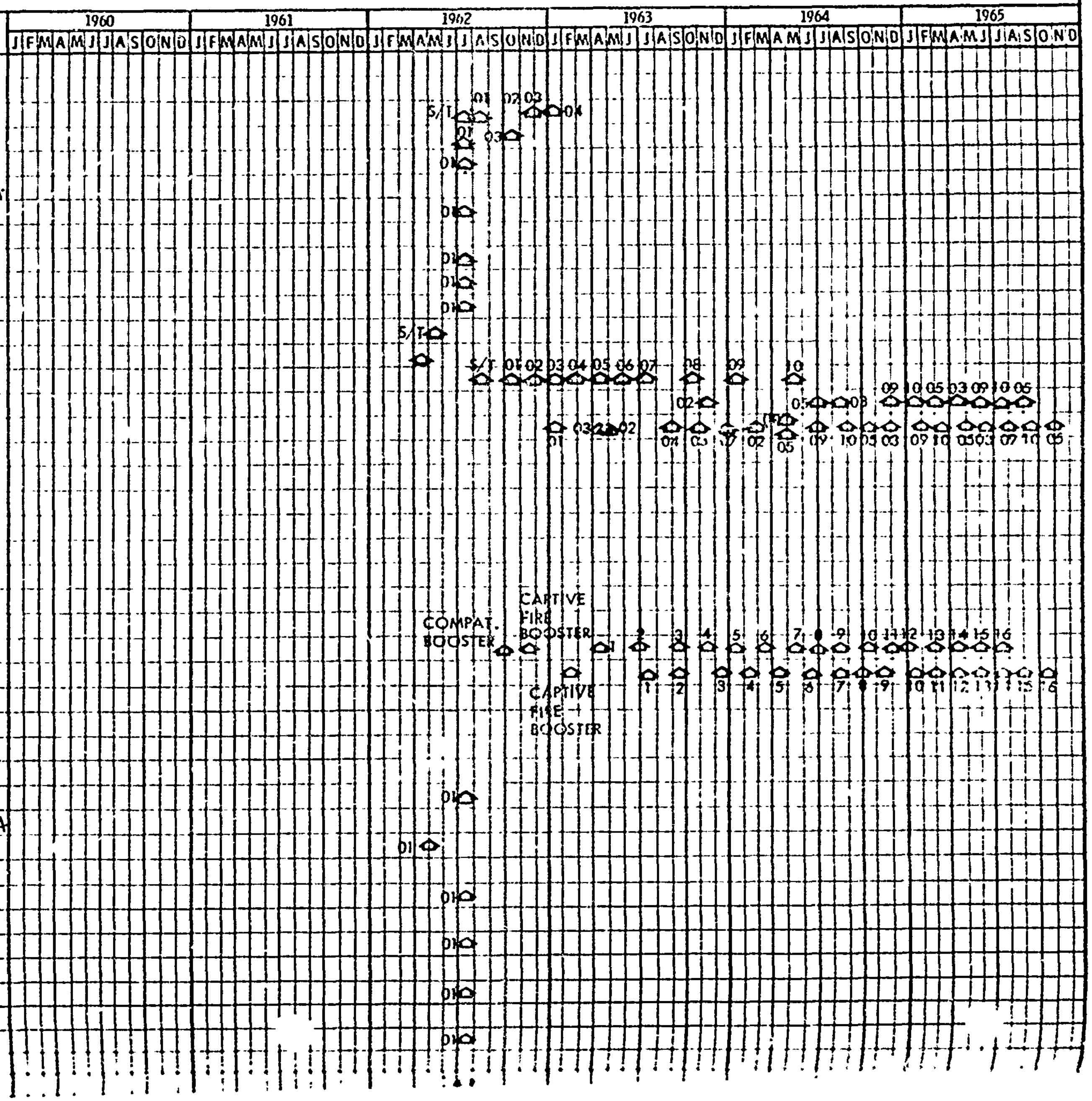
MASTER PHASING CHART 1.1

# AIR VEHICLE

DYNA SOAR STEP 1

BOEING-AF 33(600)-41517

1 GLIDER
2 AIR FRAME COMPONENTS AVAILABLE FOR FINAL
3 ASSEMBLY
4 PROPULSION AVAILABLE FOR INSTALLATION
5 SECONDARY POWER AVAILABLE FOR INSTALLATION
6 ENVIRONMENTAL CONTROL AVAILABLE FOR INSTALLA-
7 TION
8 FIRE PROTECTION & SAFETY SUBSYSTEM AVAILABLE
9 FOR INSTALLATION
10 CREW STATION AVAILABLE FOR INSTALLATION
11 CREW ESCAPE AVAILABLE FOR INSTALLATION
12 PERSONNEL PROTECTION AVAILABLE FOR INSTAL.
13 TRANSITION SECTION AVAILABLE TO MARTIN
14 INTEGRATION COMPLETE - SHOP COMPLETE
15 - REFURBISHMENT COMPLETE
16 - SIL COMPLETE
17
18
19 BOOSTER
20 AIR FRAME STRUCTURES AVAILABLE
21 PROPULSION AVAILABLE FOR INSTALLATION
22 SECONDARY POWER AVAILABLE FOR INSTALLATION
23 FIRE PROTECTION & SAFETY SUBSYSTEM AVAILABLE
24 FOR INSTALLATION
25 INTEGRATION COMPLETE - SHOP COMPLETE
26 - VTF COMPLETE (BALTIMORE)
27
28
29 AVIONICS
30 GLIDER PRIMARY & SECONDARY FLIGHT CONTROL
31 AVAILABLE FOR INSTALLATION
32 BOOSTER FLIGHT CONTROL AVAILABLE FOR INSTALLA-
33 TION
34 PRIMARY VEHICLE GUIDANCE AVAILABLE FOR
35 INSTALLATION
36 RADIO GUIDANCE BACK-UP AVAILABLE FOR
37 INSTALLATION
38 GLIDER FLIGHT INSTRUMENTATION AVAILABLE FOR
39 INSTALLATION
40 COMMUNICATION & TRACKING EQUIPMENT AVAIL.
41 FOR [illegible]TALLATION
42 ANTENNAS WINDOWS & FEEDLINES AVAILABLE FOR

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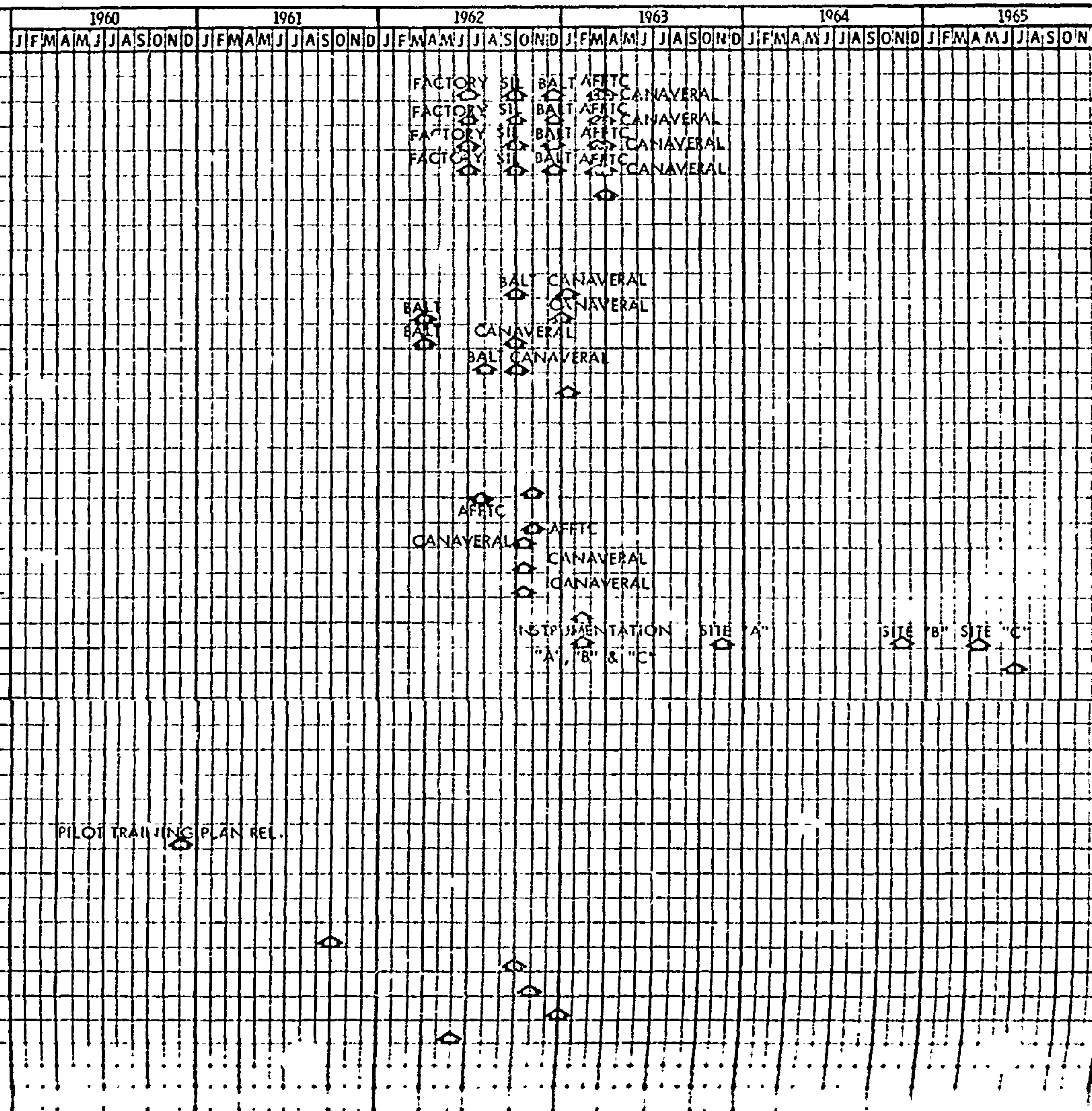
MASTER PHASING CHART 1.2

# GSE & FACILITIES

DYNA SOAR STEP 1

BOEING-AF 33(600)-41517




1 GLIDER GSE
2 HANDLING & TRANSPORT EQUIP. AVAIL.
3 SERVICING & ENVIRONMENTAL EQUIP. AVAIL.
4 MAINTENANCE & TEST EQUIP. AVAIL.
5 GRC CHECKOUT EQUIP. AVAIL.
6 INTE ION COMPLETE
7
8
9 BOOSTER GSE
10 HANDLING & TRANSPORT EQUIP. AVAIL.
11 SERVICING & ENVIRONMENTAL EQUIP. AVAIL.
12 MAINTENANCE & TEST EQUIP. AVAIL.
13 GROUND CHECKOUT EQUIP. AVAIL.
14 INTEGRATION COMPLETE
15
16
17 BASE & RANGE GSE
18 B-52/GLIDER GSE AVAIL. AT AFFTC
19 LAUNCH SUPPORT EQUIP. AVAIL. AT CANAVERAL
20 COMM & TRACKING EQUIP. GSE AVAIL.
21 GUIDANCE EQUIP. GSE AVAIL. AT CANAVERAL
22 RANGE SAFETY EQUIP. GSE AVAIL. AT CANAVERAL
23 TELEMETRY STATION GSE AVAIL. AT AMR
24 LANDING SITE GSE AVAIL.
25 INTEGRATION COMPLETE
26
27
28 TRAINING EQUIPMENT
29 PILOT TRAINING AIDS & EQUIP. AVAIL.
30 GROUND CREW TRAINING AIDS & EQUIP. AVAIL.
31 (NOT DETERMINED)
32 INTEGRATION COMPLETE
33
34
35 INDUSTRIAL FACILITIES
36 GLIDER INDUSTRIAL FACILITIES COMPLETE
37 GLIDER CAT. I TEST FACILITIES COMPLETE
38 BOOSTER INDUSTRIAL FACILITIES COMPLETE
39 BOOSTER CAT. I TEST FACILITIES COMPLETE
40 GLIDER/BOOSTER CAT. I TEST FACIL. AVAIL.
41
42

5C.1

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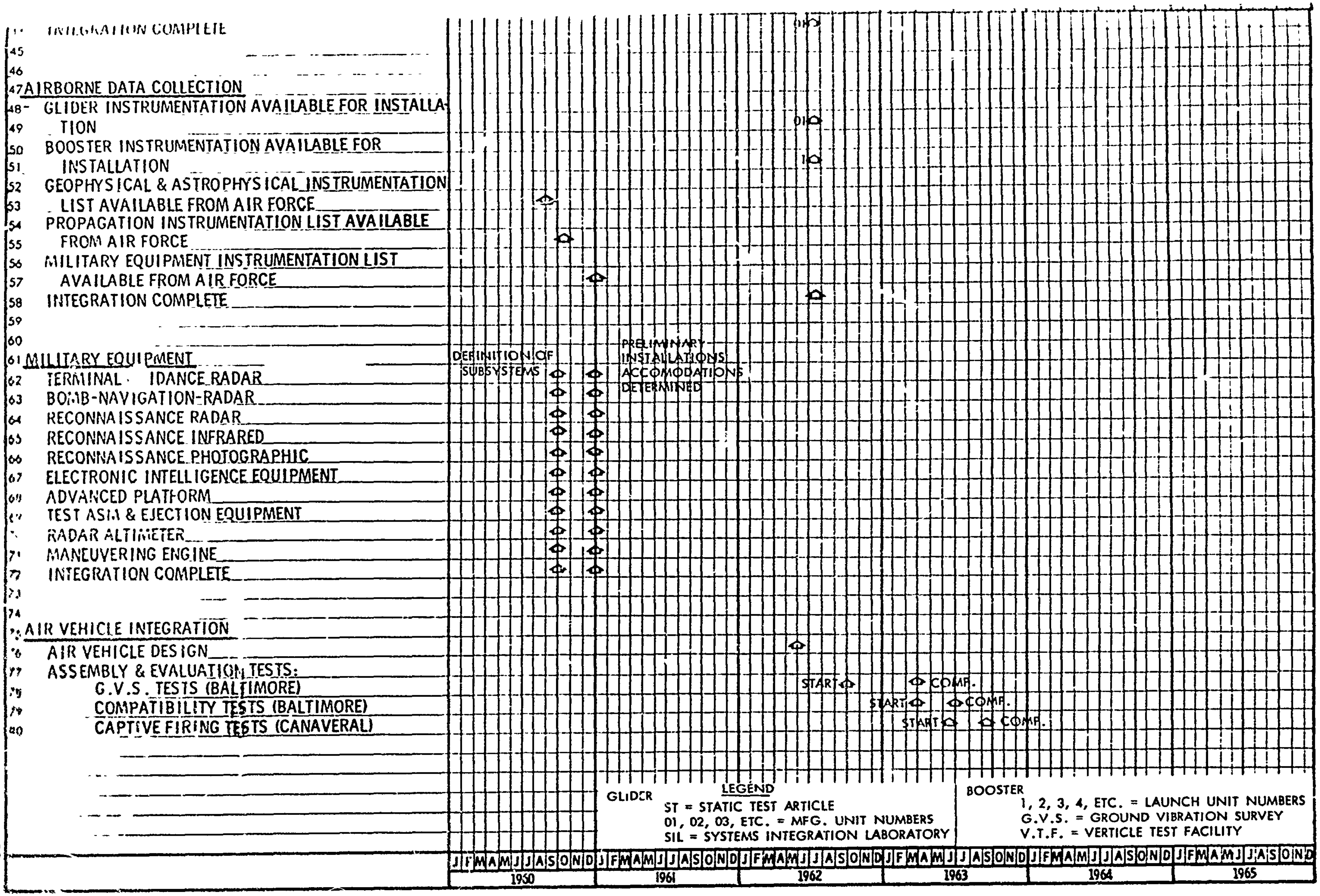
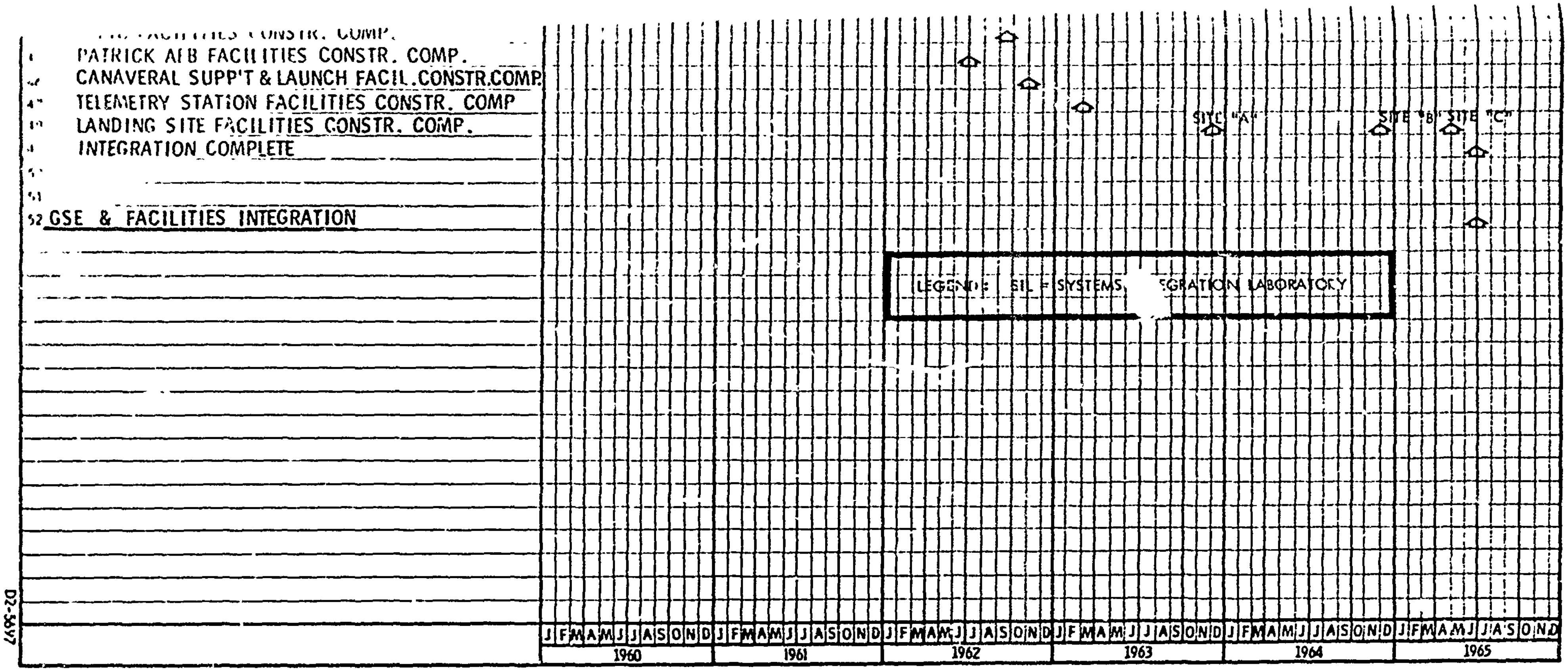

INTEGRATION COMPLETE
45
46
47 AIRBORNE DATA COLLECTION
48 GLIDER INSTRUMENTATION AVAILABLE FOR INSTALLA-
49 TION
50 BOOSTER INSTRUMENTATION AVAILABLE FOR
51 INSTALLATION
52 GEOPHYSICAL & ASTROPHYSICAL INSTRUMENTATION
53 LIST AVAILABLE FROM AIR FORCE
54 PROPAGATION INSTRUMENTATION LIST AVAILABLE
55 FROM AIR FORCE
56 MILITARY EQUIPMENT INSTRUMENTATION LIST
57 AVAILABLE FROM AIR FORCE
58 INTEGRATION COMPLETE
59
60
61 MILITARY EQUIPMENT
62 TERMINAL IDANCE RADAR
63 BOMB-NAVIGATION-RADAR
64 RECONNAISSANCE RADAR
65 RECONNAISSANCE INFRARED
66 RECONNAISSANCE PHOTOGRAPHIC
67 ELECTRONIC INTELLIGENCE EQUIPMENT
68 ADVANCED PLATFORM
TEST ASM & EJECTION EQUIPMENT
RADAR ALTIMETER
71 MANEUVERING ENGINE
72 INTEGRATION COMPLETE
73
74
75 AIR VEHICLE INTEGRATION
76 AIR VEHICLE DESIGN
77 ASSEMBLY & EVALUATION TESTS:
78 G.V.S. TESTS (BALTIMORE)
79 COMPATIBILITY TESTS (BALTIMORE)
80 CAPTIVE FIRING TESTS (CANAVERAL)
DEFINITION OF SUBSYSTEMS
PRELIMINARY INSTALLATIONS ACCOMODATIONS DETERMINED
01
01
1
START
COMP.
START
COMP.
START
COMP.
LEGEND
GLIDER
ST = STATIC TEST ARTICLE
01, 02, 03, ETC. = MFG. UNIT NUMBERS
SIL = SYSTEMS INTEGRATION LABORATORY
BOOSTER
1, 2, 3, 4, ETC. = LAUNCH UNIT NUMBERS
G.V.S. = GROUND VIBRATION SURVEY
V.T.F. = VERTICLE TEST FACILITY
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1960
1961
1962
1963
1964
1965



... FACILITIES CONSTR. COMP.
PATRICK AFB FACILITIES CONSTR. COMP.
CANAVERAL SUPP'T & LAUNCH FACIL.CONSTR.COMP.
TELEMETRY STATION FACILITIES CONSTR. COMP
LANDING SITE FACILITIES CONSTR. COMP.
INTEGRATION COMPLETE
52 GSE & FACILITIES INTEGRATION
SITE "A"
SITE "B"
SITE "C"
LEGEND: SIL = SYSTEMS INTEGRATION LABORATORY
J F M A M J J A S O N D
1960
1961
1962
1963
1964
1965

MASTER PHASING CHART 1.3

# SYSTEM DEVELOPMENT TEST

DYNA SOAR STEP 1

BOEING-AF 33(600)-41517

| | | |
|---|---|---|
| 1 | TEST AIRCRAFT | |
| 2 | B-52 CARRIER MOD. & INSTRUMENT COMP. | |
| 3 | SUPPORT A/C MOD. & INSTRUMENT COMP. | |
| 4 | INTEGRATION COMPLETE | |
| 5 | | |
| 6 | | |
| 7 | AIR LAUNCH TEST SUPPORT & RANGE ACTIVATION | |
| 8 | DATA ACQUISITION EQUIP. INSTL. & CHECKOUT | |
| 9 | COMM. & TRACKING EQUIP. INSTL. & CHECKOUT | |
| 10 | TEST CONTROL CENTER INSTL. & CHECKOUT | |
| 11 | BASE SERVICES & EQUIP. INSTL. & CHECKOUT | |
| 12 | INTEGRATION COMPLETE | |
| 13 | | |
| 14 | | |
| 15 | GROUND LAUNCH TEST SUPPORT & RANGE ACTIVATION | |
| 16 | DATA ACQUISITION EQUIP. INSTL. & CHECKOUT | |
| 17 | COMM. & TRACKING EQUIP. INSTL. & CHECKOUT | |
| 18 | TEST CONTROL CENTER INSTL. & CHECKOUT | |
| 19 | BASE SERVICES & EQUIP. INSTL. & CHECKOUT | |
| 20 | GUIDANCE EQUIP. INSTL. & CHECKOUT | SITE "A" LANDING FACIL. COMP.; SITE "B" LANDING FACIL. COMP. |
| 21 | DOWN RANGE LANDING SITE AVAIL. FOR OPS | INSTR. AVAIL. ALL SITES |
| 22 | RANGE SAFETY CHECKOUT COMPLETE | SITE "C" LANDING FACIL. COMP. |
| 23 | SEARCH RECOVERY AND/OR RESCUE C/O COMP. | |
| 24 | SHIPS AVAIL. ON STATIONS | |
| 25 | INTEGRATION COMPLETE | |
| 26 | | |
| 27 | | |
| 28 | AIR LAUNCH OPERATIONS | PREL. TEST REQMTS. ESTAB.; SYSTEM DEV. TEST PLAN REL'D. |
| 29 | PREPARATIONS & PLANNING COMPLETE | START AIR LAUNCHES; COMPLETE AIR LAUNCHES |
| 30 | TEST CONDUCT | 1ST POWERED FLIGHT |
| 31 | ANALYSIS & REPORTING COMPLETE | FINAL FLT. TEST ANALYSIS REPORT |
| 32 | | |
| 33 | | |
| 34 | UNMANNED GROUND LAUNCH OPERATIONS | PREL. TEST REQMTS. ESTAB.; SYSTEM DEV. TEST PLAN REL'D. |
| 35 | PREPARATION & PLANNING COMPLETE | |
| 36 | TEST CONDUCT - LAUNCHES COMPLETE | |
| 37 | ANALYSIS & REPORTING COMPLETE | FINAL FLT. TEST ANALYSIS REPORT |
| 38 | | |
| 39 | | |
| 40 | MANNED GROUND LAUNCH OPERATIONS | PREL. TEST REQMTS. ESTAB.; SYSTEM DEV. TEST PLAN REL'D. |
| 41 | PREPARATION & PLANNING COMPLETE | |
| 42 | TEST CONDUCT - LAUNCHES COMPLETE | |
| | ANALYSIS & REPORTING COMPLETE | |

CONFIDENTIAL

5.04

44

45

46 SYSTEM DEVELOPMENT TEST INTEGRATION

47 STEP I COMPLETE

FINAL MANAGEMENT REPORT 3/31/66

J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

1960 1961 1962 1963 1964 1965

MASTER PHASING CHART 1.4

# PROGRAM MANAGEMENT & SUPPORT

DYNA SOAR STEP 1

BOEING-AF 33(600)-41517

1960 · 1961 · 1962 · 1963 · 1964 · 1965 (J F M A M J J A S O N D)

| | | |
|---|---|---|
| 1 | LOGISTICS | |
| 2 | LOGISTICS SUPPORT MANAGEMENT | INITIAL PLAN RELEASED |
| 3 | SUPPLY SUPPORT AVAIL. | AFMTC BOOSTER; AFFTC GLIDER; AFMTC GLIDER |
| 4 | BASE & ANCILLARY EQUIP. MAINT. AVAIL. | |
| 5 | TRANSPORTATION EQUIPMENT REQUIRED | CANAVERAL; AFFTC; SITE "; SITE "B"; SITE "C" |
| 6 | TRAINING (GROUND PERSONNEL) | C.T.G. TO BALTIMORE; BOOSTER TO CANAVERAL |
| 7 | INTEGRATION COMPLETE | START SYSTEM FAMILIARIZATION |
| 8 | | 3-1-66 |
| 9 | | |
| 10 | SUPPORT | |
| 11 | D.E.I. | |
| 12 | MOCK-UP INSPECTION COMPLETE | |
| 13 | C.T.C.I'S COMPLETE (EACH) | |
| 14 | SAFETY OF FLIGHT INSPECTION COMPLETE | BOOSTER; GLIDER; AIR LAUNCH; MANNED GROUND LAUNCH |
| 15 | SYMPOSIA COMPLETE (EACH) | |
| 16 | | |
| 17 | | |
| 18 | PLANNING & REPORTING | |
| 19 | PROGRAM PLAN TO AF | |
| 20 | REPORTING (INITIAL REPORTS) | COST; MGT STATUS & TECH |
| 21 | PEP SYSTEM (INITIAL INSTALLATION) | (NOT DETERMINED) |
| 22 | | |
| 23 | | |
| 24 | | |
| 25 | STEP IIA PLANNING & ANALYSIS | (NOT DEFINED IN STATEMENT OF WORK) |
| 26 | | |
| 27 | | |
| 28 | | |
| 29 | | |
| 30 | | |

CONFIDENTIAL

~~CONFIDENTIAL~~

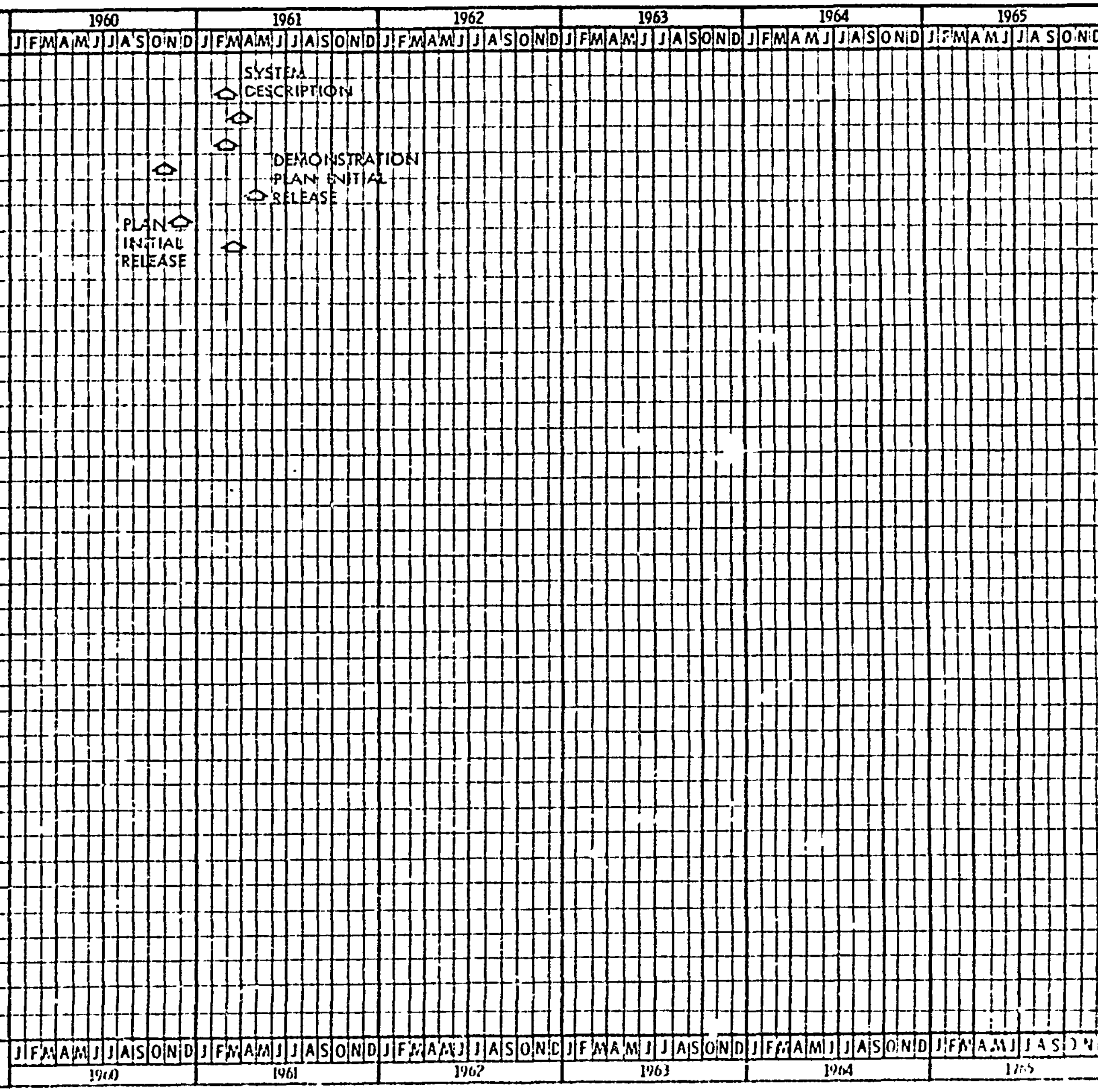
MASTER PHASING CHART 1.5

# SYSTEM INTEGRATION

DYNA SOAR STEP 1

BOEING-AF 33(600)-41517

1 SYSTEM INTEGRATION
2 TECHNICAL INTEGRATION
3 SYSTEM REQUIREMENTS ESTABLISHED
4 SYSTEM ANALYSIS COMPLETE
5 SYSTEM TRADE STUDIES COMPLETE
6 RELIABILITY PROGRAM
7 MAINTAINABILITY PROGRAM
8 FIRE PROTECTION & SAFETY ANALYSIS
9 HUMAN FACTORS PROGRAM COMPLETE



INDIVIDUAL
DETAILED
PLANS

This section contains summaries of the detailed plans which, in conjunction with document D2-5697, make up the total Dyna Soar (Step I) Program Plan. Inasmuch as all of these plans have not been published at the release of this revision to D2-5697, only those detailed plans which have been published are summarized in this section. An outline of the contents of each of the unpublished plans is included at this time. As these plans are released, a summary of each will replace the outline.

OUTLINE OF DYNA SOAR (STEP I)

PROGRAM COST ESTIMATE PLAN (D2-5697-1)

I. Forward

A. Authority - Paragraph C.4.4.9.1 of Boeing document D2-7438.

B. Reference - Boeing document D2-5697.

II. Document Distribution Address Sheet

Headquarters
Directorate of Systems Management
Air Research and Development Command
United States Air Force
Wright-Patterson Air Force Base, Ohio
ATTN: RDZSXB, Colonel W. L. Moore, Jr.

Air Force Ballistic Missile Division
ATTN: WDZMB, Major Gail Halvorsen
Air Force Unit Post Office
Los Angeles 45, California

Commander
HQ. Aeronautical System Center
ATTN: LMSD
Wright-Patterson Air Force Base, Ohio

III. Table of Contents

IV. Introduction

A. Statement of conditions or ground rules

B. Basis of estimate

C. Explanation of cost breakdowns and cost curve charts

V. Summary (See note below)

A. Total program estimate cost breakdown (standard Boeing cost summary).

B. Total program cumulative costs versus time.

VI. Detail Plan (See note below)

A. Explanation as required, of cost data for each Level 3 program element.

VI. Detail Plan (Continued)

B. Cost breakdown of each Level 3 program element.

C. Cumulative costs versus time for each Level 3 program element.

Note: Space is to be provided for Associate Contractors involved in the booster program and cost data related thereto will be provided to the Air Force separately by the Associate Contractors involved.

SUMMARY

of

FACILITY PLAN

D2-5697-2

The Facility Plan depicts the facilities requirements of the Systems Contractor, Associate Contractors and major Subcontractors at the Test Range Sites for the Dyna Soar (Step I) Flight Test Program. Facility type equipment will be included in the "Government Furnished Equipment Plan", D2-5697-11, 60RDZ-158, and industrial manufacturing facilities will be defined in the "Manufacturing Facility Plan", D2-5697-15, 60RDZ-162, and are not included.

Implementation of the Test Range Facilities will be in accordance with the narrative and schedules shown in "Test Site Facilities", D2-5697, Volume 2.

The Facility Plan is set forth in five segments corresponding to the Level 4 element breakdown under "Test Site Facilities", in the Program Plan, D2-5697.

Detailed information for the following items is not included due to the lack of information available at this time.

LAUNCH COMPLEX AREA

PATRICK AIR FORCE BASE SPACE

AIR SUPPORTED STRUCTURES AT DOWN RANGE STATIONS

CAPE CANAVERAL TEST CONTROL CENTER

TRACKING, TELEMETRY, INSTRUMENTATION COVERAGE AND PORTABLE INSTRUMENTATION DOWN RANGE

AIR FORCE SPACE REQUIREMENTS

BIO-MEDICAL LABORATORY FACILITIES

As the foregoing information becomes available, it will be incorporated into the Facility Plan along with the information from the Associate Contractors who have not yet been determined.

A forecast sheet showing a summary of the P-300 funds required at each of the site locations is given on page 6.2-10.

## AIR LAUNCH TEST PROGRAM

### INTRODUCTION

The Air Force Flight Test Center (AFFTC), Edwards Air Force Base, California, will be the location of the air launched flight test program. Facilities will be required for assembling and functionally testing the glider, electronic equipment repair and storage, and administrative and engineering staffs. Support facilities for the B-52 carrier airplane and chase aircraft will be required. Test operations will require radio and telephone communications, instrumentation for data collection, optics and various supporting services.

### AFFTC

Space at AFFTC will be comprised of a hangar of approximately 44,200 square feet (gross), a glider engine repair shop of 1600 square feet (net), a test control center of 3500 square feet (net), and miscellaneous support area. The hangar will house the following activities and functions:

Glider assembly test area where the glider will be assembled and all necessary modifications, installations, calibrations and tests accomplished.

Office Area for administrative and engineering personnel and support functions consisting of reproduction, film storage and processing, conference rooms, classified data file, and administration communications.

Laboratory space for testing of electronic components.

Shop area including common shops (mechanical, wood, machine, welding, and paint shops).

Storage space for the storing of glider subsystems, spare parts, components and servicing and handling equipment.

The test control center will be required for a radio communications center, operations control and monitoring, plotting boards, and for ground telemeter receiving, recording, play-back and quick-look display. The area will be used for both preflight checkout and flight test data acquisitions.

All of the space requirements are available at AFFTC with the exception of the glider engine repair shop which will be added to the existing X-15 engine repair shop. Modification of existing area and construction of the engine repair shop area will be funded from P-300 funds administered by the Corps of Engineers. The design criteria for this work will be accomplished by the Systems Contractor. The activation of AFFTC is scheduled for the second quarter, 1963, when Systems Contractor peak manpower of 185 people is attained.

A capsule qualification testing program will be conducted at the Hurricane Supersonic Research Site, Utah. The capsule will be sled tested using the existing government facilities which will not require modification or new construction.

## GROUND LAUNCH TEST PROGRAM

### INTRODUCTION

The Atlantic Missile Range will be used for the ground launch test program with the use of support facilities at Patrick Air Force Base. Ground launching of the DS-1 vehicle will occur at Cape Canaveral. The down range facilities will consist of two telemetry stations and three combination telemetry stations and landing sites.

### PATRICK AIR FORCE BASE

Patrick Air Force Base will be used in support of the Ground Launch Program at Cape Canaveral. All of the space is available and will not require P-300 funds for its implementation. The support functions and area to be located at Patrick Air Force Base are: Office, 5400 square feet (net); Warehousing, 5000 square feet (gross), including 575 square feet for salvage and reclamation; and Shop Area for range aircraft checkout, 750 square feet (net).

### CAPE CANAVERAL SUPPORT AND LAUNCH FACILITIES

Cape Canaveral is described in three sub-sections:

1. Glider Support Area

   Space will be required in the industrial area to accomplish glider functional processing, vehicle assembly, and supporting services. The space currently planned to satisfy these requirements consists of Glider A & T buildings with a total of 64,800 square feet (gross). This will house: (1) office area including office support functions (conference room, data display vault, files, and communications); (2) assembly and functional test area to maintain, modify, rework, and functional test glider subassemblies, test support equipment, and test console components; (3) instrument calibration and certification laboratory area to certify secondary standards, maintain, modify, rework and calibrate electrical and mechanical test instrumentation; (4) common shop areas (electric and electronic, sheet metal and mechanic, machine, welding, wood, paint, automotive shop, etc.); (5) receiving and inspection area to receive and inspect the glider after it has been airlifted to Cape Canaveral from Seattle; (6) stores area to provide for spare component storage, treasury stores for raw materials, common hardware parts, electric and electronic parts; hazardous stores for oils, paints, lubricants and other flammable items.

The peak Systems Contractor manpower of 468 people will be attained during the third quarter 1963. This figure includes the personnel who will be stationed at Patrick Air Force Base and at CCMTA. It does not include the Associate Contractor's requirements. The Systems Contractor will prepare the design criteria for the glider support area, for a field office and shop building, the test control center, and a telemetry building. The Booster Associate Contractor will prepare the design criteria for the Booster Support area and Launch Complex area. Systems Contractor will maintain close coordination with the Associate Booster Contractor.

2. Booster Support Area

In addition to Company-owned facilities and equipment available for use on the program, the Associate Booster Contractor will utilize Government-owned facilities supplied under Government contract SFC 33(600)-32326. These facilities consist of laboratory and test equipment, furniture and fixtures, portable tools, vehicles and material handling equipment.

Space for the Dyna Soar Booster Program will be required in the industrial area; the specific requirements and their respective solutions are indicated as follows:

| Requirement | Satisfied Through |
|---|---|
| (1) ~~Receiving~~ inspection and vehicle storage | Utilization of a standard hanger floor in the industrial area such as "T" or "U"; no modification required. |
| (2) Office space for personnel of the Aerojet General Corporation and Martin Company not permanently assigned to the firing complex. | Utilization of normally available office space in a standard hangar; minor modification required for efficient usage. |
| (3) Housing for support activities such as telemetry play-back area, electrical and mechanical, transducer, instrument, environmental, valve cleaning and hydraulic laboratories and machine shop. | Assumed utilization of existing Martin laboratories, in hangars "T" and "U". |

3. Launch Complex Area

Systems Contractor requirements in this area consist of field office and shop building 3200 sq. ft., a test control center 3500 sq. ft., and a telemetry building 3500 sq. ft., and certain modifications to the launch complex required to accommodate the glider and related equipment and instrumentation.

These will be incorporated into the Associate Booster Contractor's requirements in the launch complex area and are described in the following documents:

A. ER 11337-3, Dyna Soar Step I Program Plan, Vol. III, Facilities Plan, dated 12 August 1962, prepared by the Martin Company.

B. LR 60345, Dyna Soar Step I Booster Engines, Vol. I, Program Plan, dated 13 August 1962, prepared by the Aerojet General Corporation.

TELEMETRY STATION FACILITIES

All existing facilities that comprise the Atlantic Missile Range may be used to support the ground launch tests of the Dyna Soar Program. At certain stations of the Atlantic Missile Range, including Station 5 (San Salvador), Station 9.1 (Antigua), and at Landing Sites A, B, and C, it is known that certain modifications to existing facilities and construction of new facilities will be required.

The Systems Contractor will be responsible for the preparation of design criteria for modification and new construction at all the telemetry stations.

At Station 4 (San Salvador) it will be necessary to add telemetry and command control equipment including two new antennas. These additions will be effected within existing buildings, no new construction required.

At Station 9.1 (Antigua) it will be necessary to add to the transmitter, receiver, and telemetry buildings. No new buildings will be required.

At Landing Sites A and B it will be necessary to re-activate the main base and those buildings that are required to provide space for instrumentation, and to construct a building or van pad for new AN/FPS-16 radar stations. Existing instrumentation buildings will be used without modification.

Landing Site C is a new station and all instrumentation facilities will be new. At Landing Site C, as at all other AMR Stations where new equipment is required, consideration is being given to the use of mobile vans to house instrumentation. Landing Site C will require new buildings or van pads to accommodate AN/FPS-16 radar, MOD II radar, transmitter facility, receiver facility, landing control facility, telemetry facility, and a weather station.

In order to support instrumentation facilities at Landing Site C it will be necessary to construct the following new facilities: administration building, a warehouse, auto maintenance, subsistance building, quarters buildings, sanitary facilities, flammable storage, fire stations, power plant and system, water plant and system, and sewage treatment plant and system.

Consideration is being given to the housing of Landing Site C personnel in nearby commercial facilities. If this appears feasible, it will be possible to eliminate the construction of those items mentioned which are required for personnel only.

LANDING SITE FACILITIES

Dyna Soar Ground Launch Test Program will require three glider landing sites. Two of these are existing AMR stations and the third will be a new station.

The Systems Contractor will prepare the design criteria for modification and new construction at each of the three landing sites.

Landing Sites A and B are existing AMR stations. Landing Site A is maintained on a stand-by basis and Landing Site B is maintained on a care-taker basis. At both landing sites, it will be necessary to lengthen and widen the existing runways, provide new glider shelters, re-activate certain main base buildings to provide facilities for living quarters, administrative offices, storage, maintenance shops, supporting utilities, etc. New construction or modification of an existing building for a flight control center will be required.

Landing Site C will be a new AMR station and will require new construction of a landing strip, glider shelter, test control center, glider shop and office and storage, in addition to those facilities required to support instrumentation facilities at the landing sites.

MAINTENANCE AND OPERATION COSTS

This plan is to include estimates of cost per requirement per fiscal year for the maintenance and operation of each Contractor maintained facility or portions thereof. It is understood that this requirement is to cover the Contractor's operations at the Down Range Stations. These operations are not yet firm, hence cost estimates for the operation and maintenance of these stations cannot be submitted at this time.

SUMMARY OF P-300 COST FORECAST

| | Location | Cost |
|---|---|---|
| 5.0 | AFFTC | $ 140,000 |
| 6.0 | Patrick Air Force Base | None |
| 7.0 | Cape Canaveral | |
| | Support Area | 1,256,500 |
| | Launch Area | 4,700,000 |
| 8.0 | Telemetry Stations | 3,026,500 |
| 9.0 | Landing Sites | 5,823,300 |
| | Total | $14,946,300* |

**Note**

*The amounts contained in this figure which have not been budgeted by FY 61 and 62 161's will be budgeted in subsequent fiscal year submittals, or by negotiation as the funds are required.

SUMMARY

OF

MAKE OR BUY PLAN

No. D2-5697-3

The "Make or Buy Plan" is a document which sets forth all elements of the Dyna Soar program as far as they are known at the time and gives a "Make" or a "Buy" decision on each element.

"Make" items are defined as those items fabricated, assembled or modified by the System Contractor.

"Buy" items are defined as those items purchased by the System Contractor for installation and use as received from the Vendor or Subcontractor.

Elements are compatible with those in Attachment 1 Statement of Work, System 620A, Dyna Soar (Step I), ID 60 LMSD-4196 (Boeing Document D2-7438) Date 6 August 1960. Areas covered include the Air Vehicle, GSE and Facilities and System Development Test hardware requirements (exclusive of government furnished and associate contractor items, such as the booster). Hardware items are limited to those required for that portion of the Dyna Soar Step I Military Test System for which the System Contractor is responsible.

MAKE OR BUY - Continued

The configuration of the Dyna Soar Vehicle covered by this document is that given in D2-6909, entitled "Preliminary System Design Report, preliminary System Analysis and Integration Report, and Preliminary System Description of the Dyna Soar Step I" and revisions to the systems contractor "Make or Buy Plan" will be keyed to revisions of the System Description.

This summary section is specifically the System Contractors' "Make or Buy Plan" and will contain lists of Make or Buy Items until such time as firm agreements are reached with the WSPO. However, as the program develops and information becomes available, sections will be added covering 'associate contractor' "Make or Buy Plans".

# OUTLINE

# OF

# RELIABILITY PROGRAM PLAN

# D2-5697-4

## OUTLINE OF MAINTAINABILITY PLAN

(D2-5697-5)

The System Contractor's plan for implementing a comprehensive maintainability program on Dyna Soar (Step I) is outlined below. A definition and the objectives of maintainability are given in Volume II of this document under System Integration, of which Maintainability is a fourth-level element.

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2.1 Design Monitor and Assistance

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3.0 DESIGN REVIEW AND EVALUATION

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7.3 Inertial Guidance *Associate Contractor

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7.5 Booster Guidance *Associate Contractor

* To be determined

## SUMMARY OF MANUFACTURING PLAN D2-5697-6

The Manufacturing Plan summary contained herein, depicts the process methods and operation sequences that the Systems Contractor plans to use to accomplish the manufacturing task of the Dyna Soar Step I Program. Document D2-5697-6 is scheduled for release at a later date.

### I. GENERAL PLAN

The major assembly, installation, and functional test operations for this program will be performed by the Dyna Soar Production Unit. Parts fabrication and fusion and resistance welding sub-assembly will be accomplished by the Manufacturing Program Support Section in order to make the maximum use of existing equipment, facilities and skills.

The Glider and Transition Section will be manufactured and tested per drawing, and transported to the Systems Integration Laboratory (SIL) as separate units. The glider will be manufactured so that major component units such as the capsule and the wing may be replaced with the minimum of effort. The glider and the transition will be interchangeable at attach points. Doors, panels, control surfaces and other sub-assemblies will be manufactured to the degree of interchangeability specified for each item with the minimum use of master tooling.

The integrated record system will be used to provide a complete record of all planned and unplanned events during the assembly, installation, and functional operations.

The integrated record system will provide in process manufacturing configuration control as required and reliability reporting in compliance with contractural requirements as outlined by MIL-R-26674, "Reliability

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I. GENERAL PLAN (Continued)

Program for Ballistic Missile and Space Systems".

The planning instructions to the factory for details and sub-assemblies will include the operations and inspection necessary to comply with applicable Military Specifications, Process Specifications, Engineering Drawings, and Functional Test Documents and Bulletins.

The Manufacturing Development Program will develop new manufacturing process techniques where required to support the Dyna Soar Program. This program is presented in "60 RDZ 154, D2-5697-7, Manufacturing Development Plan Dyna Soar Step I".

II. DETAIL PARTS FABRICATION

Most detail parts consist of straight lines, flat planes or elements of cones minimizing fabrication problems. The inner structure is essentially made up of thin gauge Rene ' 41 sheet stock parts and tubing with machined fittings and weldments. The exterior skins are made of thin gauge Rene ' 41, except in high temperature areas where the skin will be thin gauge MO-0.5 Ti.

The round tubular element of the truss work will be formed by reducing the end and in some cases expanding the center straight section. The ends will be reduced by draw forming and rotary swaging of the transition area. The center section will be expanded by a fluid forming process. Forming techniques for swaging and expanding tubing are being developed under MDP "Forming". The tubes will be trimmed and the ends slotted with the use of abrasive cutoff wheels.

Square and rectangular tubes will be constructed of brake formed or die formed hat sections covered with a flat sheet sheared to size. The

II. DETAIL PARTS FABRICATION (Continued)

sheet will be resistance welded to the hat section. Other similar skin panel support structure members will be fabricated in a similar manner. Resistance welding techniques are being developed by the MDP on welding. Corrugated skins will be formed on a corrugation machine. Straight trimming of corrugation will be accomplished with an abrasive cutoff wheel.

Straight edges of skins made from Rene' 41 and MO-0.5 Ti will be trimmed by bandsawing and filing or by high speed milling. Machining techniques are being developed under the MDP on machining.

Leading edge skins made from MO-0.5 Ti will be contoured by standard roll forming at room temperature. Leading edge ribs made of MO-0.5 Ti will be formed using conventional draw dies heated by die contact.

Molybdenum leading edges and panels will be coated with molybdenum disilicide in a fluidized bed or furnace retort. Coating techniques are being developed under the MDP on coating.

III. GLIDER ASSEMBLY PLAN*

A. ESCAPE CAPSULE ASSEMBLY

1. Main Truss Assembly

The main truss assembly includes all of the primary framework, truss work and support fittings. Frame and truss assemblies will be located in a jig together with connecting longeron assemblies and skin support beam assemblies. These assemblies will be joined by welding, or mechanical fasteners.

*see Figure I for glider flow sequence.

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III. GLIDER ASSEMBLY PLAN

A. ESCAPE CAPSULE ASSEMBLY (Continued)

2. Capsule Structural Assembly

The capsule structural assembly consists of the capsule main truss assembly skins, panels, beams and supports. The main truss assembly will be located in the capsule structure assembly jig. The spars and beams will be jig located and attached to the main truss assembly.

The skin supports, nose cap support and nose gear hinge fittings will be jig located. The skin panels will be then installed. Sealing will be accomplished throughout the assembly operations.

3. Pilot's Compartment Assembly

The water wicking panels will be bonded. Bonded techniques will be developed under MDP on bonding. These panels plus joining members will then be welded to form the pressure shell assembly in a weld jig.

The pressure shell assembly will then be loaded into the pilot's compartment assembly jig.

Side window assemblies, windshield assemblies, access panel assemblies, hatch assemblies, etc., will be joined to the pressure shell assembly.

The assembly will be sealed during progressive stages of manufacture and then after final sealing a pressure test will be performed.

## III. GLIDER ASSEMBLY PLAN

### A. ESCAPE CAPSULE ASSEMBLY (Continued)

4. Pilot's Compartment Final Assembly

The pilot's compartment will be loaded into a holding fixture for installation of equipment, lining, systems, controls and seat assembly. Complete functional tests and another proof pressure test will be performed.

5. Minor Sub-assemblies

Details and components will be made up as sub-assemblies, whenever practical, to facilitate installation and reduce tooling requirements.

6. Capsule Final Assembly

The capsule structure assembly is located in the capsule final assembly tool for installation of the pilot's compartment, equipment compartments, and the final structural installations. The upper support structure for the skin panels, access panels, doors and the hatch is located and installed. The exterior windshield and side windows are installed and sealed. The parachute door, nose gear, and stabilizers assemblies are installed with their respective actuating equipment. Sealing and insulation are applied to surfaces which are permanently attached.

7. Capsule Final Installation and Test

The capsule final assembly will be located in a pickup fixture for installation of the windshield cover assembly, equipment, systems and controls. System continuity checks will be performed.

III. GLIDER ASSEMBLY PLAN (Continued)

B. AFT BODY AND WING ASSEMBLY

1. Aft Body Truss Frame Assembly

The aft body main truss assembly includes the body truss work aft of the escape capsule assembly. The truss assembly will be assembled by loading frames, connecting longerons, secondary trusses and skin support beams. These members will be welded and fastener locations drilled and finished. All fittings attached to the truss assembly will be located and held in the jig for welding or mechanical attachment.

2. Aft Body Structure Assembly

The aft body truss assembly will be positioned in the aft body structure assembly jig and indexed to mastered locations. Frames and supports for equipment container doors, antenna assemblies and supports, air brake assemblies, access panels and skin assemblies will be attached.

3. Aft Body Final Assembly

The aft body structure assembly will be positioned in a holding tool for installation of the systems, controls, equipment container assembly and the equipment access doors. The section will be checked for alignment.

4. Wing Structure Assembly

The wing structure assembly consisting of spar and beam assemblies, secondary trusses, spar and terminal fittings, main landing gear fittings, fin attach fittings, elevon hinge fittings, actuator fittings and the beam supports will be indexed to locators in the wing structure jig. Welding and drilling of fastener holes will be accomplished in the jig.

III. B. AFT BODY AND WING ASSEMBLY (Continued)

4. Wing Structure Assembly (Continued)

The skin assemblies and access panels will be installed. The assembly will be sealed during the progressive stages of manufacturing.

5. Wing Final Assembly

The wing structure assembly will be loaded into a holding tool. The main landing gear and fin assemblies will be joined to the wing using coordinated hole locations. The controls and systems will be located and installed.

6. Aft Body-Wing Joining

The aft body will be loaded into a holding fixture and indexed to mastered locations. The assembly will be checked for alignment. The wings will be brought into position and joined to the body. Systems installations will be completed and the joining areas will be skinned. Continuity checks and operational checkouts will be accomplished.

C. GLIDER JOINING AND FINAL ASSEMBLY

The aft section will be mated to the aft end of the escape capsule and joined. The rudder and elevons, will be installed. Sub-systems and equipment installations will be joined together between the escape capsule and the aft section.

D. GLIDER FINAL INSTALLATION AND TEST

The nose cone and wing leading edge segments and other previously fitted items will be installed. Equipment and systems operational checks will be conducted. The pilot's compartment and other pressurized areas will be tested.

III. E. GLIDER FACTORY GROUND CHECKOUT

Prior to delivery of the assembled glider to the Systems Integration Laboratory for integration and operational system checkout, the Manufacturing Department will perform checks to verify that systems are installed per Engineering drawings. These checks will consist of circuit continuity checks of wiring between electronic components and mechanical actuators, checks of mechanical actuators for correct throws and control surfaces for structural interference and checkout of the operation of the separation mechanism. In addition, pressure checks will be made on hydraulic, pneumatic $N^2$ $O^2$, hydrazine and liquid oxygen systems. Where practicable these checks will be made concurrently with the assembly operation. Upon completion of the ground checkout the glider will be transported to SIL.

IV. TRANSITION ASSEMBLY PLAN

A. TRANSITION STRUCTURE ASSEMBLY

The transition structure assembly will be assembled in a vertical type assembly tool. The frame assemblies, stiffeners, longerons, forward separation fittings and the aft separation ring assembly are jig positioned and attached by rivets and bolts. In addition, supports, doublers, brackets and rocket fittings will be located by the assembly tool. Skin panels for both sides will be secured by standard fasteners. Sealing will be accomplished before removing from the assembly tool. The forward separation fitting locations and the aft ring assembly attach points will be controlled by master gages.

B. TRANSITION ASSEMBLY ABLATIVE COATING

The transition structure assembly will be installed in a tool for

IV. B. TRANSITION ASSEMBLY ABLATIVE COATING (Continued)

the application of ablative coating using a controlled feed. The ablative coating technique will be developed by the MDP for plastics.

C. TRANSITION FINAL ASSEMBLY

A tool will hold the assembly for final installation and checkout. The section will be transported to Systems Integration Laboratory (SIL).

V. FLIGHT TEST INSTRUMENTATION

The installation of flight test instrumentations will require special manufacturing techniques to be developed under the "Manufacturing Development Program". It will be the policy to install flight test instrumentation on an in-sequence basis, wherever possible.

Close Coordination with engineering will be maintained to insure that scheduling of the installation of flight test instrumentation is compatible with the airframe design and that manufacturing capabilities are developed in time to accomplish the installations.

VI. GROUND SUPPORT EQUIPMENT

Ground support equipment is that equipment that directly supports operating and maintenance functions of launch and flight and includes that identical equipment used in prior operations but excluding special tooling and facilities.

Ground support equipment and components will be ordered in the same manner as components of the glider. Component parts and minor sub-assemblies will be fabricated by the Manufacturing Program Support Section. Major assemblies and electrical components will be manufactured and tested by the Dyna Soar Production Unit.

VII. SYSTEMS INTEGRATION AND TEST PLAN

Manufacturing Engineering will prepare and release Integrated Record System plans to be used by the Manufacturing, Engineering, and Quality Control personnel performing system integration and test work described in Section I. This planning will be based on requirements established by Engineering.

Liaison and maintenance service on the Integrated Record System planning released for AFFTC and AMR will be provided by Manufacturing Engineering personnel.

VIII. QUALITY CONTROL

Dyna Soar Quality Control operations are responsible for the witnessing and approval of all facets of manufacturing and test of the product to assure conformance to Engineering, Quality Control and contractual requirements. This includes, but is not limited to, receiving, tooling, fabrication, assembly and test activities, inplant.

Quality Control will approve and maintain records of these functions. The records will reflect all planned and unplanned events that have occurred from the inception to the completion of the product, as well as reflecting product conformity to applicable Engineering specifications and Quality Control requirements.

The integrated record system will provide a proven record system for the manufacture and systems test of the Dyna Soar Program and will further provide for:

1. Reliability data reporting.
2. Manufacturing and inspection in-process control.
3. Complete manufacturing history with each end item.
4. Record of inspection acceptance.

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VIII. QUALITY CONTROL (Continued)

A. OPERATIONS

The Dyna Soar Manufacturing Quality Control responsibilities are fulfilled by the following functions within the Quality Control Department:

1. Procurement and Receiving

All material received into the Boeing Airplane Company for the Dyna Soar Program will be subjected to receival inspection processing.

a. Incoming

The conformance of incoming materials, parts, assemblies, tools and equipment to applicable customer and company requirements will be determined through the administration of pre-planned tests and/or inspections. The pre-planned inspection and test requirements released by Engineering or Quality Control will provide for determining the presence of essential characteristics of the article.

The test operations will be conducted by or under the surveillance of Quality Control personnel to ensure conformance with test requirements.

Sampling plans will be applied to incoming material whenever permitted by consideration of calculated risks in accordance with MIL-STD-105, MIL-STD-414, or other approved sampling plans developed by the Quality Control Engineering Unit.

Visual and dimensional techniques constitute the principal

VIII. A. 1. a. (Continued)

receiving inspection effort.

b. Outside Quality Control

Throughout the Dyna Soar Program, Quality Control will ensure that acceptable standards of quality and workmanship are observed by the Boeing suppliers. A survey and evaluation of selected potential suppliers' quality control systems will be accomplished to determine adequacy. Subsequent surveillance of selected suppliers' manufacturing operations is exercised to verify that adequate and continuing quality control is being maintained.

Vendors' rating listings, based upon the suppliers' performance, will be maintained and will be utilized by the Procurement Quality Section to inform the Materiel Department and the Outside Quality representatives of areas that require correction.

2. Fabrication

Fabrication Inspection personnel inspect detailed parts for conformity to approved tools or Engineering drawings. In those areas where a process may affect the acceptance of a detail part, it is necessary to critically control the process. Such process control may necessitate destructive testing, supplemental checks of the process, or close surveillance for a period of time in order to verify the adequacy of the process.

All material drawn from stores will be identified prior to the initial fabrications operation and positive identification

VIII. A. 2. Fabrication (Continued)

must be established prior to final acceptance of the detail part.

3. Assembly and Installation

Assembly and installation quality will be verified by progressive inspection in accordance with applicable drawings and specifications. Small or simple assemblies will be inspected for compliance with all Engineering requirements following completion. Large or complex assemblies and installations will be progressively inspected during the cours of manufacture with a final inspection following completion.

Progressive inspection will be controlled by an appropriate record structure which will provide for total accountability of all required operations.

4. Functional Test

Quality Control will verify that all electric, electronic and mechanical components and installations have been tested in accordance with applicable Engineering and Quality Control requirements. This will include verification of the certification and calibration of both Boeing and Subcontractor or Vendor supplied test equipment. Inspection records of all tests performed on individual components and systems will be maintained by Quality Control.

5. Quality Control Laboratories

The laboratories are operated and maintained to provide services and evaluations required to establish the acceptability of a component or a process and give technical advice and assistance to its parent organization as well as other

VIII.A. 5. Quality Control Laboratories (Continued)

groups. This service is rendered by the Chemical, Mechanical Test, Radiographic, Ultrasonic, Pyrometric and Investigation groups.

The Laboratory Section will also conduct investigative surveys to assure compliance to Engineering processes.

6. Quality Engineering

a. Manufacturing Defect Analysis and Control

A weekly defect analysis for all shops indicating the types of defects incurred during each analysis period will be prepared as soon as the manufacturing work load warrants.

The purpose of the analysis is to permit management to more closely analyze the types of defects contributing to the overall shop quality trends. In addition, it will provide information necessary for line supervisors to effect corrective action. A quality chart based upon rework and scrap costs will be included indicating the ratio of costs to shop production manhours. Basic defect data will be derived from the inspection records. A monthly report on parts with a record of repetitive rejections will be issued to management to assist in pointing out those areas requiring immediate corrective action.

IX. MANUFACTURING AND ENGINEERING SUPPORT

The Manufacturing and Engineering Support Section (M&ES), which is a segment of the Manufacturing Department, is set up to provide manufacturing services to the Engineering Design Development, staff and

IX. MANUFACTURING AND ENGINEERING SUPPORT (Continued)

laboratory organizations, and the Manufacturing Methods Development organizations. These services include the fabrication of wind tunnel models, mockups, test parts and assemblies, including the HETS structures and test configuration capsules, and also including manufacturing support of testing in the engineering lab areas. During fabrication of the HETS hardware and other developmental test structure, and during development of process specs, manufacturing will gain experience in fabrication assembly and tooling of super alloy, materials and at the same time help establish and develop shop skills required to support production. The M&ES Section is separated from that of the Production Manufacturing organization in order that test parts can be manufactured with a minimum of interference with production schedules. It is important that production schedules not be interrupted and that reassembly and development operations continue on an expedited basis in order that engineering design decisions can be made on a timely basis.

In the performance of this support and manufacturing's responsibility, established Experimental policies utilizing streamlined release methods, abbreviated type tool design, skilled shop personnel, which allows the use of limited soft tooling, will be adhered to. This will result in extreme flexibility in handling complicated manufacturing process requirements with minimum flow time and at lowest possible cost commensurate with program objective.

X. ASSOCIATE CONTRACTOR PLANS

The Manufacturing Plans of the established associate contractors have been received as part of Martin Company-Document ER11377-1 "Program Plan Volume I, Dyna Soar Step I" and Aerojet General Corporation-Document

X. ASSOCIATE CONTRACTOR PLANS (Continued)

L60345 "Booster Engine Program Plan, Dyna Soar Step I." Since these plans have not been coordinated and negotiations completed, they will be included following coordination.

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# GLIDER ASSEMBLY SEQUENCE FLOW

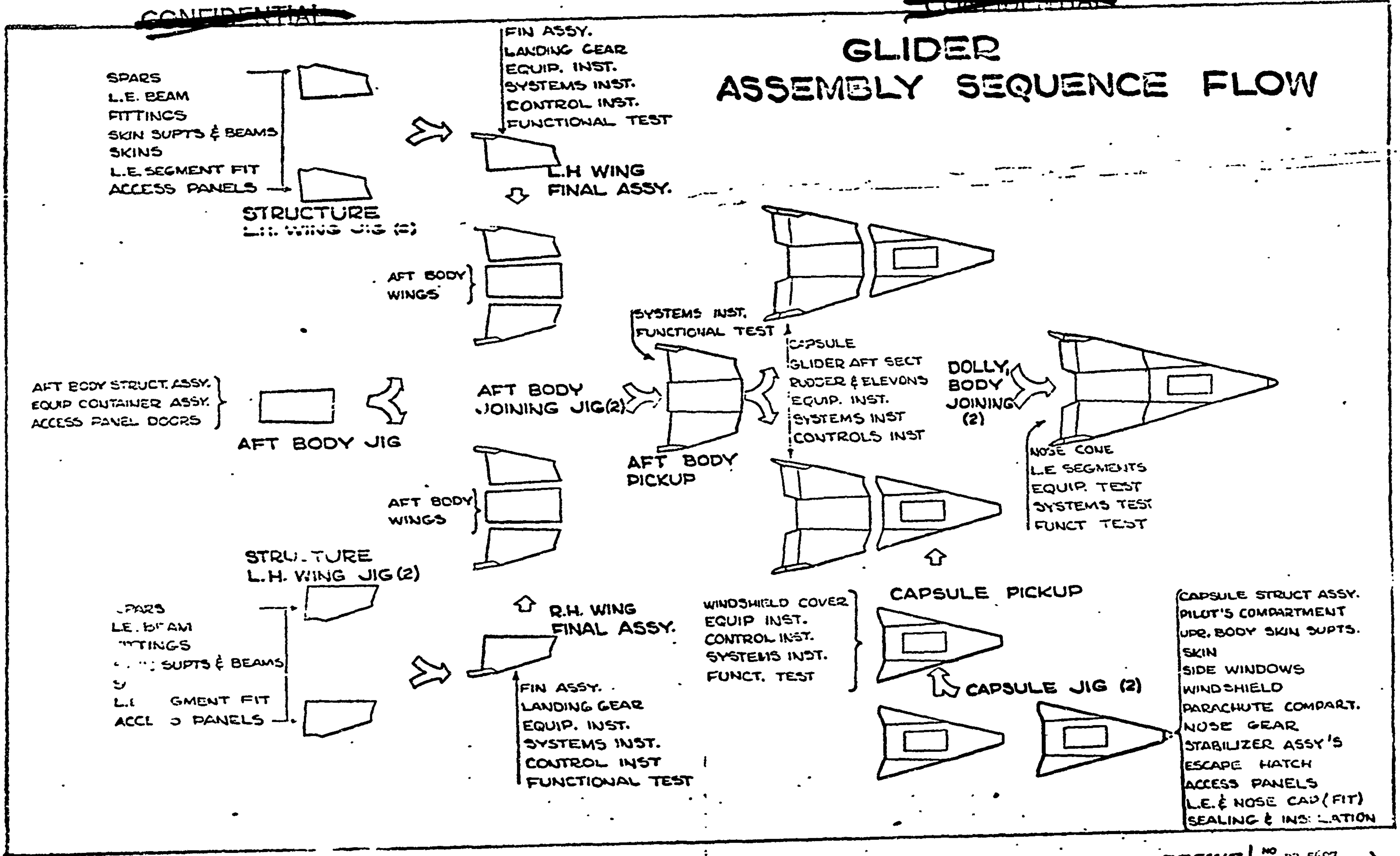


Figure I.

OUTLINE OF MANUFACTURING METHODS DEVELOPMENT PLAN

(D2-5697-7)

The Manufacturing Methods Development Program will provide manufacturing "know-how" to fabricate test parts and assemblies and the Static Test and Ground Test Vehicles. Development of the "know-how" to fabricate these items will provide the basic capability to produce subsequent vehicles. Development will be limited to support only the fabrication of a research and development system. Full utilization will be made of all available information developed under government contracts to prevent any duplication of effort and realize a maximum economy for this Manufacturing Methods Development Program.

The Plan is divided into seventeen "Projects" or packages of work. Each "Project" is discussed by categories such as justification, anticipated accomplishments, approach, timing and cost. Presented in these categories (where applicable) are discussions that include: disparities between present "state-of-the-art" and Step I fabrication requirements; justification for method, process, technique, or equipment development; theories and opinions; facts and references; successful and unsuccessful investigations; miscellaneous background information; and alternate approaches. The Plan also includes over-all manpower, cost and timing information required to accomplish the Manufacturing Methods Development Program.

The purposes of the Manufacturing Methods Development "Projects" are, in general, to cover requirements beyond the present "state-of-the-art", or where no technology exists, and fall under one of the following:

A. Providing assistance to Engineering, as requested, in the establishment of design criteria and requirements for processes and process specifications in new applications;

B. Providing manufacturing techniques and information necessary for accomplishment of the Step I contractual tasks where present technology requires improvement or none exists;

C. Providing assistance in establishing manufacturing "know-how", where none presently exists or where it requires improvement; to support fabrication of test hardware;

D. Providing tool criteria for new materials and new techniques;

E. Determining facility requirements for new techniques and materials necessary to meet Step I contractual commitments;

F. Establishing training criteria required for the fabrication of the Step I Dyna-Soar.

The Manufacturing Development Section, Aero-Space Division, will conduct the Manufacturing Methods Development Program. Individual programs (packages of work that are within the work outlined under the Manufacturing Methods Development Projects) are initiated according to an established procedure. All programs are monitored by the Manufacturing Development Section Dyna-Soar Project Chief to see that statements of work, objectives, budgets, schedules, and report requirements are within the scope of the Manufacturing Methods Development Plan (as approved by the Air Force) and the directives of the Dyna-Soar Manufacturing Manager.

Additonal information concerning this plan will be covered in the detailed Manufacturing Methods Development Plan, D2-5697-7.

**SUMMARY**
**OF**
**TOOLING PLAN**
**D2-5697-8**

The contents outlined herein represent a summary of the tooling concept that the Systems Contractor plans to use to accomplish the tooling task of the Dyna Soar Step I Program. The Document D2-5697-8, Tooling Plan, is scheduled to be released at a later date.

GENERAL TOOLING POLICY

Special Tooling is defined as that equipment manufactured, modified or purchased solely for the manufacture, test, handling, or transportation (except that concerned with launch and recovery) of the parts assemblies and equipment, and not useable on other contracts or classified as Ground Support Equipment.

Maximum Manufacturing skills shall be used in the development of the tooling program to reduce tooling costs to a minimum. Tooling will be minimum, consistent with the program reliability requirements and material characteristics. Multi-use and multi-purpose type tools will be utilized where practicable. Minor assembly and final assembly tooling will use expandable tools to facilitate incorporation of Engineering Design changes and improvements in Manufacturing techniques developed during the research and early period of fabrication.

Tool drawings will be functional but will be complete enough to assure configuration control.

Tools will be of a quality to provide interchangeability or replaceability to the degree specified by contractual requirements. Program Master Gages will define hardware inter-faces between the Systems Contractor, Subcontractors and Associate contractors.

GENERAL TOOLING POLICY (Continued)

Where practical handling equipment will utilize a single design for both inplant and outplant functions.

The tooling plan for the booster is included in The Martin Company's document ER 11337-1; likewise Aerojet General's Document LR60345 AJG, includes tooling plans for the booster engines. However, these documents have not been fully coordinated between Boeing and the associate contractors and therefore this portion of the tooling plan is not included in D2-5697. It will be included after the coordination has been completed.

# I. TOOLING

Tools will be furnished only where existing facilities and special equipment are not available or where overall manufacturing economies will be realized by their use.

When furnished, they will be of a minimum tooling concept to perform their required functions.

Numerical control will be utilized for tool fabrication where practical.

# II. MASTER TOOLING

## A. MASTER MODELS

Master models will be limited since most surfaces of the glider are generated by straight line elements. Portions of the glider with compoundcontour lines will require master models.

1. Fin to Wing Leading Edge

   These models will duplicate the fin and wing in the area of the leading edge, where there are compound contours.

2. Rudder

   These models will duplicate the rudder in the leading edge and trailing edge, and tip areas where compound contours exist.

3. Lower Leading Edge of Fin

   These models will duplicate the fin lower leading edge.

4. Nose Section

   This model will duplicate the nose cone forward of the production break and the structure aft of the break.

5. Glider to Booster Transition Area

   This model will duplicate the transition section in areas of joining to the glider and booster.

A. MASTER MODELS (CONTINUED)

6. Capsule Body in Hatch Area

This model will duplicate the capsule in the compound area of the hatch.

B. MASTER GAGES

Master gages will be the control media for production tools for interchangeable and/or replaceable items where dimensional control or numerical control techniques are inadequate and for those tools where manufacturing and/or maintenance cost savings can be realized through their use.

The following items will require master gages to control the critical attach points and/or contour and periphery. The master gage family consists of the master gage itself and a secondary gage to control the mating structure. Where more than one copy of the master gage is required for vendor's or associate contractor's use, a master control gage is also required.

1. Escape Capsule to Aft Glider Joint
2. The Transition to Booster Attachment
3. Parachute Compartment Cover
4. Pilot's Escape Hatch
5. Fin to Wing Attach
6. Elevon to Wing Attach
7. Rudder to Fin Attach
8. Body to Wing Attach
9. Leading Edge to the Leading Edge Beams
10. Leading Edge to the Leading Edge Beams of the Aft Glider

B. MASTER GAGES (CONTINUED)

11. Nose Cone Attach
12. Pilot's Compartment to Structure Attachment
13. Windshield Cover
14. Trim Surface Attachment
15. Aft Glider to Transition Joint
16. Air Brake Panel
17. Package Electronics
18. Equipment Container
19. Capsule Separation Rocket Attach
20. Glider to Transition Separation Rocket Attach
21. Nose Gear
22. Main Gear
23. Main Gear Door
24. Fin Leading Edge to Beam - Upper and Lower

III. ASSEMBLY TOOLING

A. FINAL ASSEMBLY TOOLS

Final assembly tools will include jigs, dollies used to support the glider structure for systems installation and joining operations, slings and other handling devices.

In the design of these tools every effort will be made to minimize the handling of the glider to minimize damage.

1. Pilot's Escape Capsule Dolly

Capsule dolly will be used for supporting the capsule for final assembly of capsule. It will support capsule at jack points and will be used in conjunction with Aft Glider Dolly for joining the Escape Capsule to Aft Glider at final assembly. Dolly will be

A. FINAL ASSEMBLY TOOLS (CONTINUED)

1. Pilot's Escape Capsule Dolly (Continued)

designed with adjustable support points with sufficient movement to allow joining. Dolly may also be used as an inplant transportation dolly.

2. Aft Body Structure X-Ray Dolly

This dolly will be used to support the welded body structure for X-ray inspection. It will provide for the positioning of the structure for X-raying the welds.

3. Body Sling - Frame Assembly to X-Ray Dolly

Body sling will be the spreader bar type used to handle welded fuselage structure for loading and unloading of X-ray dolly.

4. Aft Glider Dolly

Dolly will support aft glider section in final assembly area for installations of sub-assemblies and equipment. It will support glider at jack points and will be used in conjunction with pilot's escape capsule dolly for joining. It may also be used as an inplant transportation dolly for the completed glider.

5. Rocket Engine - Air Launch Acceleration Sling

The engine sling will be a beam type sling designed to hoist the engine and maintain level attitude while transferring from engine shipping container to engine installation dolly.

6. Rocket Engine - Air Launch Acceleration Installation Dolly

The engine installation dolly will support engine and allow engine to be moved into position mounts while glider is in the final Assembly dolly.

A. FINAL ASSEMBLY TOOLS (CONTINUED)

7. Equipment Container Dolly

This dolly will be used for the loading, transportation and installation of the equipment container.

8. Glider Sling

The glider sling will be a beam type sling which will attach to suitable approved lift points on glider structure. Sling will be used for transferring glider from glider final assembly dolly to actuator test dolly or to shipping dolly.

9. Equipment Container Sling

Container sling will be of suitable design and contruction to safely handle the container for loading or unloading into the glider.

10. Wing Joining - Scaffold

Scaffolding will be required over the wing at joining due to the fragile nature of the wing skins.

11. Protective Covers: Fin Leading Edge and Nose Cone

Protective covers will give positive protection to installed leading edges and the nose cone.

12. Wing Joining Dolly

Wing joining dolly will support the wing assembly and position it in proper attitude for joining to body structure assembly. This dolly may also be used for pickup work on wing assembly. It will allow access for landing gear installation and fin joining.

13. Fin Assembly Dolly

The dolly will be used for transporting the fin assembly to final assembly area where fins are installed.

A. FINAL ASSEMBLY TOOLS (CONTINUED)

14. Escape Capsule Sling

The escape capsule sling will be a beam type sling designed to handle the capsule from assembly jig to final assembly dolly and from shipping crate to base joining dolly.

B. MAJOR ASSEMBLY TOOLS

Major assembly tools will include assembly jigs, dollies or related tools designed for the purpose of fabrication within the major assembly area.

Some of the known requirements of major assembly tools are:

1. Escape Capsule Assembly Jig

This tool will receive and hold for assembly the capsule frame assembly, leading edge beams, parachute compartment skin assemblies and panels.

2. Aft Body Final Assembly

The aft body final assembly jig will provide for positioning the aft body structure assembly. The jig will locate and hold the equipment container and the access doors for installation. The access door location will be controlled by master gages.

3. Wing Structure

The wing structure jig will hold the spars, skin support beams, fittings, main landing gear trunnions, and leading edge beam.

4. Rudder Assembly Jig

The rudder assembly jig will assemble the complete rudder ready for attachment to the fin.

B. MAJOR ASSEMBLY TOOLS (CONTINUED)

5. Transition Assembly Jig

This jig will hold the frame members, spars, attach fittings and skin panels.

6. Elevon Assembly Jig

This jig will locate and hold the elevon spars, ribs, fittings and skin panels for the assembly operations.

7. Trim Surface Assembly Jig

This jig will locate and hold the spar and leading edge beam, the ribs, fittings and skins.

8. Pilot's Compartment Shell Assembly Jig

The pilot's compartment shell jig will hold side beams, bulkheads, frame assemblies and skin panels for assembly operation.

9. Aft Equipment Container Structure

This jig will hold frames and bulkheads in a horizontal position for assembly and skinning.

10. Aft Body Structure Assembly Jig

The aft body final assembly jig will position and install the frames, equipment container supports, access doors and skin assembly.

C. MINOR ASSEMBLY TOOLS

All jigs too large for convenient handling will be floor mounted tools. The balance will be conventional bench type tools.

1. Weld Jigs

Weld jigs for fusion welding will be made for trusses such as capsule main truss (L.H. and R.H.), aft body truss assemblies, capsule spar assemblies, wing spar assemblies (L.H. and R.H.),

C. MINOR ASSEMBLY TOOLS (CONTINUED)

1. Weld Jigs (Continued)

forward body frame assemblies and aft body frame assemblies.

2. Assembly Jigs

Assembly jigs will be required which will be combination tools allowing for spotwelding operations. Some assemblies requiring this type design will be wing leading edge beam; capsule leading edge beam; rear spar assembly; pilot's compartment; panel, pilot's compartment press shell forward bulkhead; pilot's compartment press shell aft bulkhead; pilot's compartment shell side beams; parachute door assembly; nose gear door assembly; fin skin panel assemblies and elevon skins.

3. Spotweld Jigs

A large number of spotweld jigs will be required for wing and body skin panels, escape capsule panels, access doors, etc. Possibly many of these will be used as drill jigs also for the drilling of panel attach holes.

At present it is planned to use Keller K-matic or other air feed type drills for the drilling due to drilling difficulties encountered in the material.

4. Locating Tools

Templates will be required for control of fit and attach hole locations on the panels.

Locating jigs will be used for the location of brackets and hinge points within the body for such items as the parachute box, parachute door hinge and latch locations, instrument panel brackets, pilot's entrance door hinges and latches.

## IV. DETAIL TOOLS

### A. MACHINE FIXTURES AND DIES

A number of form dies will be required for items such as aft body door, rudder panels and corrugated skin panels and skin stiffeners.

Several types of corrugation dies will be developed and quite a number of hot form dies will be required for forming of corrugated backing for aft body door panels and leading edge stiffeners.

Mill fixtures will not be made unless required to reduce shop setup time or as necessary to hold tolerances or meet production rate.

Numerical control techniques will be used where practical.

## V. HANDLING AND TEST EQUIPMENT

Handling equipment will include transportation, equipment, slings, staging and work platforms.

Mechanical test equipment will functional test the mechanical systems at the factory and at the test stations prior to glider position on the launch pad.

Likewise, the electrical test equipment will test the continuity, compatibility and other functional tests of systems at the factory and test stations prior to the glider position on the launch pad.

This equipment will be designed so that both inplant and outplant functions can be accommodated by one design when practical.

## VI. NUMERICAL CONTROL

Consideration for numerical control will be given tooling when it is practical and when it agrees with the tooling policy. The use of

VI. NUMERICAL CONTROL (CONTINUED)

numerical control for master model headers depends upon Engineerings method of releasing loft line information.

VII. QUALITY CONTROL

All tools used on the Dyna Soar program will be inspected to ensure that parts or assemblies fabricated from the tools are in accordance with Engineering drawings and that parts are interchangeable where required. In addition, the tools will be inspected as required for continuing capability to produce acceptable parts.

# OUTLINE OF CONTRACTOR'S LOGISTIC SUPPORT PLAN

(D2-5697-9)

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# OUTLINE OF GROUND SUPPORT EQUIPMENT PLAN

(D2-5697-10)

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a. Design and Development Task

b. Design Objectives

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2. Booster GSE

a. Design and Development Task

b. Design Objectives

c. Design and Development Test Plan

3. Base and Range GSE

a. Design and Development Task

b. Design objectives

c. Design and Development Test Plan

B. Manufacturing (including Quality Control)

1. Glider GSE

2. Booster GSE

3. Base and Range GSE

C. GSE Installation, Calibration, and Checkout

1. AFFTC

2. AFMTC

3. Baltimore (compatibility testing)

D. Test Operations

SUMMARY

of

GOVERNMENT FURNISHED EQUIPMENT PLAN

D2-5697-11

**Summary**

As outlines in Dyna Soar Work Statement, dated 8-6-60, par. C.4.4.9.6. a Goverment Furnished Equipment (GFE) Plan will be prepared. The definition or GFE as outlined in the above mentioned Plan covers those items of equipment which are classified under the terms of the Air Force Procurement Instructions within the following equipment schedules.

Schedule III: Machinery & Equipment

(A-1) Machinery

(A-2) Related Production Equipment

(C) Laboratory and Testing Equipment

(D) Furniture and Equipment

Schedule IV: Portable Tools, Material Handling and Automotive Equipment

(A) Portable Tools

(B) Material Handling and Automotive Vehicles

In accordance with Dyna Soar Program Planning policy all remote test base facilities equipment will be provided by the Government. Consequently, the Contractor has developed a provisioning plan for implementing these bases with Government Furnished Equipment. In the interest of minimizing Air Force costs, this plan is oriented to obtaining equipment from existing Government inventories to the maximum extent possible. Sequentially presented below are the basic elements of this provisioning plan:

A. The Contractor will submit all outplant (test site) facility type equipment requirements considered to be capital under the Contractors standard accounting policy through an Appendix "A" application to (1) a new Dyna Soar Special Facilities Contract or, (2) a suitable existing facilities contract, whichever is negotiated. Included as part of the Appendix "A" will be justification of a program relationship nature, estimated loading and purchase and installation costs, Federal Supply Classification (FSC) and Production Equipment Classification (PEC) Numbers, manufacturers name and model if applicable, required quantity, descriptive nomenclature, required funds and delivery dates, and the test site for which items are required.

B. The Appendix "A" will be processed through the Seattle Air Force Plant Representative (AFPR) to the Weapons Systems Project Office (WSPO) Flight Test Director for review and endorsement.

C. Air Research and Development Command (ARDC) will screen the Appendix "A" items for availability of existing equipment at all ARDC test sites. Items located from this screening will be appropriately noted in the Appendix "A", shipped to the appropriate Dyna Soar storage warehouse (described elsewhere in Plan) and assigned to an AFH (Contractor) account. The Air Force will be responsible for delivery of these items to the concerned sites 30 days prior to the scheduled installation dates.

D. The Logistics Support Manager (LSM) appointed to the Dyna Soar Program will screen Air Force Supply sources for the balance of the items in the Appendix "A" through the Inventory Managers assigned to control the various Federal Supply Classifications;

including test equipment, machine tools, vehicles and furniture. Items located from this source will be appropriately noted in the Appendix "A", requisitioned by the LSM, shipped to the appropriate Dyna Soar storage warehouse (described elsewhere in Plan) and assigned to an AFH (Contractor) account. The Air Force will be responsible for delivery of these items to the concerned sites 30 days prior to the scheduled installation dates.

E. Concurrent with "C" and "D" above, Aeronautical Systems Center (ASC) will be accomplishing Special Facilities Contract coverage for all the Appendix "A" items.

F. Funds will be assigned by ASC for provisioning of items determined to be available from Air Force Supply channels. The Dyna Soar Flight Test Director will negotiate the distribution of these funds between Depot Supply for centrally-procurable (CP) items, Base Supply for locally procurable (LP) items and other agencies as deemed necessary.

G. ASC will provide copies of the Appendix "A" to the Contractor, edited to exclude the items available as a result of (C) & (D) screening, and authorize Industrial Reserve screening.

H. The Contractor will screen Industrial Reserve inventories for all residual items approved in the Appendix "A" with the exception of laboratory and test equipment (Schedule III-C) on the basis that experience to-date has proven this effort to be unjustified in terms of availability versus administrative expense.

I. ASC will execute Special Facilities contract and release funds to the Contractor for procurement of items not available from ARDC test bases or Air Force Supply and for installation of all items regardless of procurement source. The Contractor procurement of these items will be approved by the Seattle AFPR/ACO.

J. The Contractor will effect procurement of those items not found to be available from Industrial Reserve and assure delivery to the designated test site.

K. The Contractor will coordinate the receival and installation of all facilities equipment transported from the warehouses to the test sites.

The Air Force will activate storage warehouses, one each at AFFTC and AMR, for the purpose of holding and disbursing facilities equipment assigned to the Dyna Soar Program at the test sites. This consideration will preclude the misplacement or misassignment of items at a time when reprocurement would be impossible by the scheduled installation date. These warehouses will be located on or in proximity to the test sites to minimize liaison and transportation problems. Accountability of equipment will be effected directly to the AFH Industrial Property Account without being processed through the Base AFW Account.

The Contractor will assign monitors within the various Air Force provisioning agencies as deemed appropriate to stay abreast of status and to determine the acceptability, regarding condition and capability, of the equipment assigned to the program.

It is intended to process known requirements for all the outplant test sites in the initial Appendix "A", since there is very little difference between the installation and date for the various sites. The starting date for equipment installation at Patrick Air Force Base will be used as a basis to establish the application submittal schedule since it represents the earliest installation date of all the test sites. A flow time of approximately fourteen months is anticipated to accomplish the complete provisioning cycle utilizing this plan. The Contractor feels this timing is reasonable and will not adversely affect program implementation.

To accommodate the varied procurement and screening channels related to this GFE provisioning plan and due to the developmental aspects of this program, the Contractor intends to solicit Special Facilities Contract contingency funds as part of the Appendix "A" application. Specific reasons and purposes for these funds are as follow:

A. For modification of items acquired through Air Force Depot and/or other supply channels or purchased by the Contractor for the account of the Government.

B. The R & D nature of the Dyna Soar Program dictates that continued design and other technological adjustments be initiated by both the Contractor and the Air Force. Facility requirements generated by these adjustments will not be foreseen far enough in advance to incorporate in the initial Appendix "A" and, in many cases, the lead time associated with processing addenda to the initial Appendix "A" would not be compatible with end required dates. In cases where timing does not permit the formal processing of an Appendix "A" addenda for these items, the Contractor will notify the Flight Test Director of the requirements and the Director will either assure availability from test site inventories or Air Force Supply sources by the and required date, or will authorize the Contractor to procure the item using the subject contingency funds.

C. For the Contractor procurement of items intended to be furnished from test site inventories or Air Force Supply sources but not available in time to meet funding required dates established by the Contractor in the Appendix "A"

For certain long lead items contained in the Appendix "A" it may be necessary for the Contractor to initiate procurement prior to the scheduled release of SFC funds. The Contractor proposes that coverage for such a possibility be afforded in the prime contract by authorizing the charging of the costs of these items to the Supply Contract on an interim basis until SFC funds are provided.

Facilities type items considered overhead expense by the Contractor's standard accounting policy will be acquired on an immediate dispatch basis from Base Supply at the test site concerned and, if not in stock, will be purchased by the Contractor at the base and charged to the separate burden center overhead account as allowable items of cost. The Contractor will submit an annual forecast of these costs to the Base Commander commensurate with Fiscal Year Budget schedules for the purpose of obtaining funding coverage.

Maintenance and operation of GFE will be the responsibility of the Contractor. Existing Air Force Base Services Support may be requested in the accomplishment of this responsibility.

Further study of Base Services capability between the Contractor, Air Force WSPO and Base personnel, will be conducted prior to the establishment of a detailed maintenance and operation plan. Results of this study will be contained in the formal issue of the GFE Plan.

It will be necessary to provision certain capital type facilities equipment to the test sites during the interim period pending establishment of the formal provisioning procedure and submittal of the initial Appendix "A" to the Air Force. These requirements will be comprised largely of administrative support items to accommodate the manpower build-up at the outplant sites as presented in the Contractor's Facility Plan, D2-5697-2. The Contractor plans that these items be provided by Base Supply under the authority of the Dyna Soar Program Supply Contract. Accountability for these items will be formally transferred to the aforementioned Special Facilities contract upon execution by incorporation in the initial Appendix "A" submittal to the Air Force. For those items not available from Base Supply, the Contractor plans to submit same to the Flight Test Director for approval and screening for availability from Government surplus and in-stock inventories. If not available from these sources, the Flight Test Director will authorize Contractor to effect purchase of these items against the Dyna Soar Program Supply Contract, with transfer of accountability to the Special Facilities Contract to be accomplished in the same manner previously described.

The above plan will be used as a basis for provisioning Government Furnished Equipment required by associate Contractors and Sub-contractors.

SUMMARY

OF

BAILMENT PROPERTY PLAN

NO. D2-5697-12

The Bailment Property Plan will carry document No. D2-5697-12 and will be readied by 12-22-60. It will list all items of Government Property, known to be required for the Dyna Soar Program, that Boeing expects to obtain under "Bailed Property Agreements" from the Air Force.

Bailment Property is described as that property which can only be obtained from the Air Force through separate bailment agreements which are negotiated between Boeing and the Air Force, and which is necessary specifically for use in performance of Contract AF 33(600)-41517. This property may not be expended or tested to destruction nor will it be installed and delivered to the Government in a contract end-item. This property must be returned to the Government in the original condition in which it was received, less fair wear and tear, unless the bailment agreement authorized modification of the property and permits its return to the Air Force in the modified form.

SUMMARY OF SUBCONTRACT PLAN
(Document D2-5697-13)

D2-5697-13, Subcontract Plan for Dyna Soar (Step I) Program, is identical to contractor's plan, DM 1025, previously submitted and approved by the Air Force.

I. TASK

The scope of the Dyna Soar program requires assistance from qualified subcontractors in research and development and manufacturing to augment Boeing effort. The procurement task is to provide the contracting, management control, monitoring of subcontractors, and traffic control of material from suppliers.

Major purchase items are enumerated in the contractor's Make or Buy Plan, Document D2-5697-3. This document, maintained on a keep-up-to-date basis, serves as the initial tool in planning the procurement program. Major subcontract items identified at this time and planned for early procurement action are:

Nose Cap

Accessory Power Unit

Reaction Control System

Pilot's Compartment Pressure and Temperature Control System

Stability Augmentation System

Secondary Guidance System

Significant milestones relative to these major subcontract items are identified and scheduled on the Dyna Soar Step I program master schedule and on the schedules accompanying subarea elements contained in Volume II of D2-5697. The schedule information contained in the program master schedule will be firmed up and expanded subsequent to the selection of the subcontractors for these systems.

II. SOURCE SELECTION

Great emphasis is placed on the best possible selection of subcontractors. To obtain the desired results, the following procedures, which have been developed and proved over a period of years, are used:

A. A statement of work is jointly prepared by the Engineering and Materiel departments.

B. A technical specification is prepared by the Engineering Department.

C. A bidders' list will be prepared and reviewed at Boeing. It will then be forwarded to the AFPR and WSPO for review and comment. The final bidders' list will recognize the Air Force comments and recommended additions.

D. The Request for Proposal will be prepared, consisting of a statement of work, technical specification, proposal instructions, administrative guide, and a transmittal letter.

E. On a development program such as Dyna Soar, the Requests for Proposal normally anticipate a Cost-Plus-A-Fixed-Fee (CPFF) type subcontract. An established formal proposal format is required.

F. Evaluation boards are established for each major subcontract item. Board members will be assigned by Boeing management from the Materiel, Finance, Manufacturing, Engineering, and Quality Control departments. The evaluation board will review the adequacy of the procurement package, evaluate subcontract proposals, make subcontractor surveys or evaluate Boeing survey team reports, and make the final selection of the subcontractor based on the collective evaluation of all elements of the task.

G. In accordance with prime contract requirements, the contractor obtains Air Force concurrence in the selection prior to proceeding with contract negotiations.

H. The subcontract is approved by the AFPR and then placed with the successful bidder.

## III. SUBCONTRACT MANAGEMENT

The areas critical to the success of the Dyna Soar subcontract program are: (a) management of the technical evolution, (b) ensuring that the subcontractor performs on schedule, and (c) that the contractor, together with the subcontractor, manages the costs of each subcontract to stay within the planned program funds. Each of these three areas will be controlled through surveillance techniques set forth below.

### A. PERFORMANCE REPORTS

Contractor requires, as part of each subcontract requirement, monthly performance reports on an established format. In essence, these reports are the subcontractor's report against his own established plan and, on receipt by contractor, are analyzed by Manufacturing, Engineering, and Procurement personnel to determine areas of excess or weakness. The evaluation of these reports initiates corrective action as required.

B. COST REPORTS

As a part of each subcontract, the supplier must furnish each month a cost report to an established format. These cost reports include actual and forecasted expenditures and are analyzed by the Materiel and Finance departments. The Materiel Department utilizes these cost reports as one of the controls with the subcontractor and maintains a summary of the cost situation on each subcontract.

C. COORDINATION CONFERENCES

Regularly scheduled coordination conferences will be held between the contractor and the subcontractor with a formal agenda for each meeting. These conferences are usually held on a "home-and-home" sequence at selected intervals. Attendance at the conferences is comprised of Engineering, Procurement, Manufacturing, Cost Analysis, and Quality Control personnel from the contractor and counterpart personnel from the subcontractor.

D. RESIDENT BOEING TEAMS

On major items Boeing may establish a resident team at the subcontractor's plant consisting of a senior resident representative (Procurement), one or more engineers, one or more Quality Control personnel, a Manufacturing representative, and a cost analyst. This team will have the responsibility to maintain on-the-spot coordination and surveillance of the subcontractor's performance.

E. CONTRACTOR ASSISTANCE TO SUBCONTRACTORS

As an outgrowth of correspondence, resident contractor team coordination, and coordination meetings, it is frequently necessary to provide assistance to subcontractors. This assistance ordinarily consists of stationing one or more specialists at a subcontractor's plant to help in overcoming the problem. This level of assistance is utilized only as a last resort. The techniques of monitorship and control set forth elsewhere in this document are designed to avoid this extensive level of contractor assistance.

F. MANAGEMENT COUNCIL

The contractor will utilize a management council consisting of members from Boeing management, associate contractors, and an executive from each of the principal subcontractors. The purpose of this council is to review the over-all program when items of significance need to be discussed jointly between the executives of the Dyna Soar team. Typical items for discussion are reorientation of the program, financial or funding changes in the program, and policies on management of the program.

IV. ASSOCIATE CONTRACTOR PLANS

Summary information regarding the procurement plans of the associate contractors, The Martin Company and the Aerojet-General Corporation, is contained in Document ER 11337-1, The Martin Company Dyna Soar Program Plan Volume I, and Proposal No. LR 60345, Aerojet-General Corporation Dyna Soar Step I Booster Engines Program Plan Volume I. Because the selection of major subcontractors for the Martin and Aerojet programs has largely been accomplished, the contractor will coordinate with the Air Force prior to initiating activity to obtain detailed subcontract plans from the associate contractors.

OUTLINE OF SYSTEM DEVELOPMENT TEST PLAN

(D2-5697-14)

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1. B-52 Carrier Modification and Instrumentation Plan

2. Test Support and Range Activation Plan

a. Data Acquisition and Processing Plan

b. Communications and Tracking Plan

c. Test Control Plan

d. Base Service Plan

3. Air Launch Operations Plan

a. Preparation and Planning

b. Associate Contractor Equipment Integration Plan

(1) Guidance & Control

(2) Communication

c. Test Conduct Plan

(1) Glider Functional and Integration Testing (SIL)

(2) Glider Assembly and Ground Tests

(3) Glider Loading (on B-52)

(4) Preflight Operations

(5) Flight Tests

(6) Glider Recovery Operations

(7) Post Flight Operations

(8) Glider Recycle Operations

3. Air Launch Operations Plan (continued)

d. Analysis and Reporting Plan

B. GROUND LAUNCH PLAN

1. Test Support and Range Activation Plan

a. Data Acquisition and Processing Plan

b. Communications and Tracking Plan

c. Test Control Plan

d. Base Service Plan

e. Guidance Equipment Plan

f. Down Range Landing Site Plan

g. Range Safety Plan

h. Search, Recovery, and Rescue Plan

i. Ships Utilization Plan

2. Unmanned Ground Launch Operation Plan

a. Preparation and Planning

b. Associate Contractor

(1) Guidance & Control

(2) Communication

(3) Booster

c. Test Conduct Plan

(1) Glider Functional and Integration Testing (SIL)

(2) Booster Functional and Integration Testing (Baltimore)

(3) Preparation for Shipment & Transportation

(4) Vehicle Assembly, Checkout and Integration at AMR

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c. Test Conduct Plan (continued)

(5) Preflight Operations

a. Booster Checkout

b. Glider Checkout

c. Flight Readiness Firing

d. Refurbish PAD

e. Countdown

(6) Flight Tests

(7) Glider Recovery Operations

(8) Post Flight Operations

(9) Recycle

a. Hangar

b. Factory

c. Post Flight

d. Analysis and Reporting Plan

3. Manned Ground Launch Operation Plan

a. Preparation and Planning

b. Test Conduct Plan

(1) Glider Functional and Integration Testing (SIL)

(2) Booster Functional and Integration Testing (Baltimore)

(3) Preparation for Shipment & Transportation

(4) Vehicle Assembly, Checkout and Integration at AMR

(5) Preflight Operations

a. Booster Checkout

b. Glider Checkout

c. Flight Readiness Firing

d. Refurbish PAD

e. Countdown

c. Test Conduct Plan (continued)

(7) Glider Recovery Operations

(8) Post Flight Operations

(9) Recycle

a. Hangar

b. Factory

c. Post Flight

d. Analysis and Reporting Plan

1+9a

BAC 1644 L-R3

SUMMARY OF MANUFACTURING FACILITIES PLAN - (D2-5697-15)

This plan will set forth a general description of the facilities required for the manufacture and support, and Category I testing of the glider, booster, and glider/booster integration. This document will also present detail schedules for "brick and mortar", equipment items, and area requirements.

GLIDER INDUSTRIAL AND CATEGORY I TEST FACILITIES

General

The primary objective of this plan is to make maximum effective use of existing facilities and equipment, and simultaneously strive for a "minimum flow" characteristic. This resulted in the concentration of: GLIDER INDUSTRIAL FACILITIES effort in Plant II areas; and CATEGORY I TEST FACILITIES effort throughout the Plant II and Developmental Center; and hazardous and high noise level operations at Remote Sites within the Seattle area complex. (See Pg. 6.15-9 (Plot Plan) and Pg. 6.15-10 (Flow Plan)

GLIDER INDUSTRIAL functions will require:

1. Rearrangement and activation of 99,700 square feet for shop area within existing buildings.
2. Utilization of 400,000 square feet of existing mutual support fabrication shops, i.e. jig erection and machine shop, etc.
3. Office areas will require 178,000 square feet.

CATEGORY I TEST functions will require:

1. Rearrangement and activation of 71,700 square feet for laboratory area within existing buildings.

2. Modification and activation of 13,760 square feet for laboratory areas within the Seattle area complex.
3. Utilization of 300,000 square feet of existing mutual support laboratories, i.e. wind tunnels, and materials and process laboratories, etc., also within the Seattle area complex.

Combining all the area requirements listed above there is a total requirement for 1,063,160 square feet, of which approximately 7% is government owned. Proposed in-plant space requirements are shown on page 6.15-11.

In determining equipment, Dyna Soar engineering documents were reviewed to determine developmental, manufacturing, tests, and process requirements. The next step was to review the availability of existing Boeing and government owned equipment and prepare a list of equipment for procurement. As new requirements arise and specific needs are finalized, the Systems Contractor will submit these items for screening and/or procurement. The Contractor will screen government surplus for such items as may be available from its Industrial Reserve inventories to satisfy these requirements.

Major subcontractors have not been established. They will be expected to adhere to the Systems Contractor's funding policy, and their requirements will be incorporated into the document when they have been determined.

The following sections of the Glider Industrial and Category I Test Facilities plan describe in further detail the existing and additional facilities needed to support the Dyna Soar Step I

Glider Industrial and Category I Test Facilities.

EXISTING GLIDER INDUSTRIAL FACILITIES

Final assembly, major assembly and subassembly will be performed in the high bay area of Plant II, using wherever possible, existing production and related support equipment. Existing production and related support equipment facilities to be used are as follows:

1. Facilities and equipment within the Plant II area will be used to support developmental tooling and detail fabrication shops.
2. Existing primary standards laboratory and the certification and calibration laboratory will support the test equipment manufacturing activity.
3. Interim office area will be located at the Developmental Center until January 1960, when final location for office area will be provided in Building 2.01, North Property, for Program Management, Engineering, Quality Control and Manufacturing office functions directly supporting the program.

ADDITIONAL GLIDER INDUSTRIAL FACILITIES

As previously stated, every effort will be made to utilize existing facilities where practicable. However, manufacturing shops and functions unique to the Dyna Soar glider, requiring stringent manufacturing supervisory control, have been provided for as an integrated manufacturing facility in the high bay area of Plant II.

A receiving inspection area is required to provide inspection of items received from suppliers so that conformance with engineering and contract specifications are assured.

Production and treasury stores are to be located within the Dyna Soar assembly complex and will issue and provide parts control.

The subassembly shop will accomplish spot and fusion welding subassembly.

The major assembly shop will be responsible for the build-up of all major assemblies, including wing, body framing and skinning.

A final assembly shop is responsible for the installation of all equipment and systems, and for the performance of continuity checks.

A refurbishing shop will be located adjacent to the assembly shops, to better utilize equipment, and will be responsible for the refurbishment and/or modification of gliders as required.

The ground support equipment shop will also be located in high bay adjacent to the assembly shops, and will be responsible for the fabrication and assembly of ground support equipment rough structures. Actual stuffing and testing will be accomplished in the electrical mechanical and assembly shop located on the balcony within the same building.

An existing Manufacturing Research laboratory will provide for the preparation and evaluation of prototype parts and test specimens for the Manufacturing Department.

The mock-up and associated office and theater area will be located in Building 2.01, North Property, adjacent to developmental support laboratories and the Dyna Soar project offices.

EXISTING AND ADDITIONAL GLIDER CATEGORY I TEST FACILITIES

The Systems Contractor will fully utilize existing research and development facilities to support Category I testing for the Dyna Soar Step I Program. Testing includes design tests required for the development and qualifying of the glider, and functional testing of production items of hardware up to and including subsystems. These tests will be accomplished in existing and in some instances in new facilities all located within the Seattle area complex.

(1) Mechanical Propulsion Laboratories

These laboratories will provide developmental and functional testing of vehicle subsystems. New test facilities at Plant II, Shuffleton and Tulalip will provide re-entry environmental conditions of temperature, altitude and dynamic loading.

(2) Structures Test Laboratories

These laboratories will provide test capabilities for static and dynamic loading of the complete glider and its components. Re-entry thermal stresses will be simulated in the Radiant Heat Laboratory. The Sonics Laboratory will investigate the effects of acoustic vibration. Basic structural development will be conducted in the materials laboratory. Minor laboratory rearrangements and new equipment will be required to accomplish the test program.

(3) Wind Tunnel

The Boeing Wind Tunnel complex provides aerodynamic testing capabilities from Mach 0 thru Mach 25. Problems of stability and control, aerodynamic heating, and static and dynamic loads will be investigated throughout this speed range in the four existing major wind tunnels.

(4) Structural Technology

The Materials and Processes groups will measure thermal and physical properties and establish materials and process specifications for the Dyna Soar Glider. Materials evaluation and effects of atmospheric environment on materials will be determined. The Dynamic Laboratory will be responsible for the calibration and instrumentation of elastic models for the Wind Tunnel program. The Acoustics Laboratory will be responsible for the simulation of the Dyna Soar sonic range. Acoustic levels will be measured during actual and simulated firings. The Structural Technology Test Program willbe accomplished in existing laboratories with minor equipment additions and modifications.

(5) Physics Technology

Physics Technology Laboratories will be utilized to support testing including Analog and Digital computing equipment, control dynamics, electrical equipment development, servo and mechanical development, communication system development and electronic type testing activities relating to the electronic subsystems.

(6) Systems Test

Systems Test will require new facilities for the Systems Integration and Developmental laboratories, and Data Storage. This requirement will be fulfilled by phasing into similar existing facilities in Building 2.01. This will provide a basis for an integrated Dyna Soar Step I facility by locating these laboratories, offices and Mock-up and Display all in Building 2.01.

The Systems Integration Laboratory will receive the glider from final assembly and is used for: final functional and compatibility tests for verification of performance and quality levels; and for the preparation of statistical and test data as required for performance analysis of the complete glider assembly.

Developmental laboratories will be used to evaluate the vehicle subsystem integration and perform engineering evaluation and test of prototype vehicle subsystems and components.

Data System's requirement includes additional area for display and storage and new Transducer Calibration equipment. An existing environmentally controlled area will be utilized for the Transducer Calibration Laboratory.

BOOSTER INDUSTRIAL AND CATEGORY I TEST FACILITIES

General

This section will outline objectives of the Booster Industrial and Category I Test Facilities Plan, summarize area requirements, give total requirement and the per cent that is government owned. In addition, it will outline method of screening for equipment requirements, and establish the funding policy for the Associate Contractor and its subcontractors. (See Vol. III - Program Plan - Facilities Plan, DS-00089, III.)

BOOSTER INDUSTRIAL FACILITIES

Existing Manufacturing and Support Facilities

This section will summarize existing facilities to be used, dev. tooling, detail fab., etc.

Additional Manufacturing and Support Facilities

This section will give brief description of new areas to be activated; including location and function to be performed in area.

BOOSTER CATEGORY I TEST FACILITIES

Existing Manufacturing and Support Facilities

This section will summarize existing facilities to be used, dev. tooling, detail fab., etc.

Additional Manufacturing and Support Facilities

This section will give brief description of new areas to be activated; including location and function to be performed in area.

GLIDER/BOOSTER CATEGORY I TEST FACILITIES

General

This section will outline objectives of the Glider/Booster Category I Test Facilities Plan, and will summarize area requirements, give total requirement and per cent that is government owned. In addition, it will outline method of screening for equipment requirements, and establish the funding policy for the Associate Contractor and its subcontractors. (See Vol. III - Program Plan - Facilities Plan DS-00089, III.)

Existing Manufacturing and Support Facilities

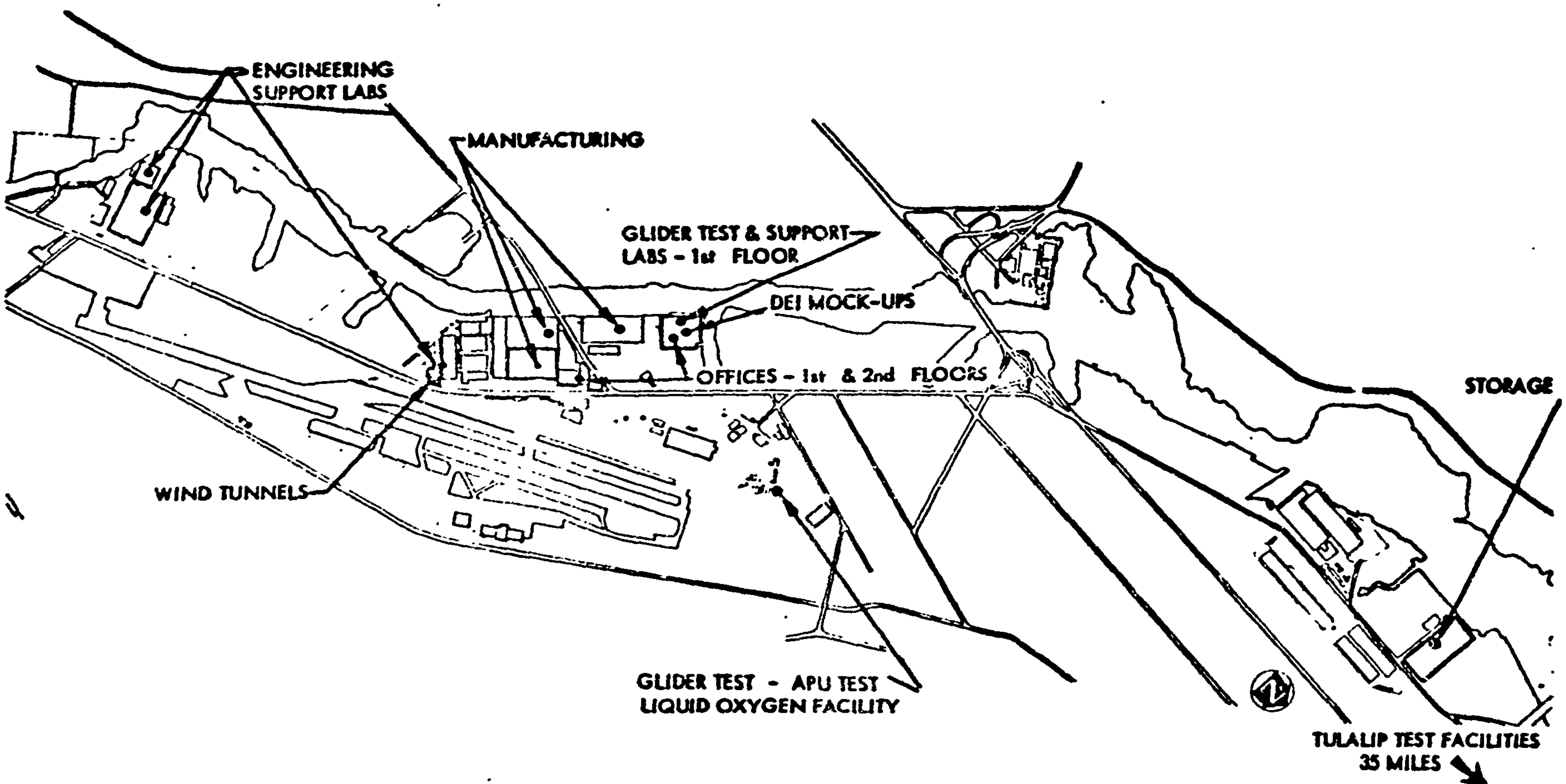
This section will summarize existing facilities to be used, deve. tooling, detail fab., etc.

Additional Manufacturing and Support Facilities

This section will give brief description of new areas to be activated, including location and function to be performed in area.

In addition to the foregoing, the Manufacturing Facilities Plan will contain detail implementation schedules for equipment, area, and "brick and mortar" construction. These schedules will be revised on a timely basis as changes in schedules or implementation action occur. This information will thus provide for a current analysis of facility requirements and schedule status, as well as a means of assuring over-all facility program direction.

Page 6.15-12 shows a flow plan of the working relationship that exists between the Systems Contractor and the Associate Contractor.

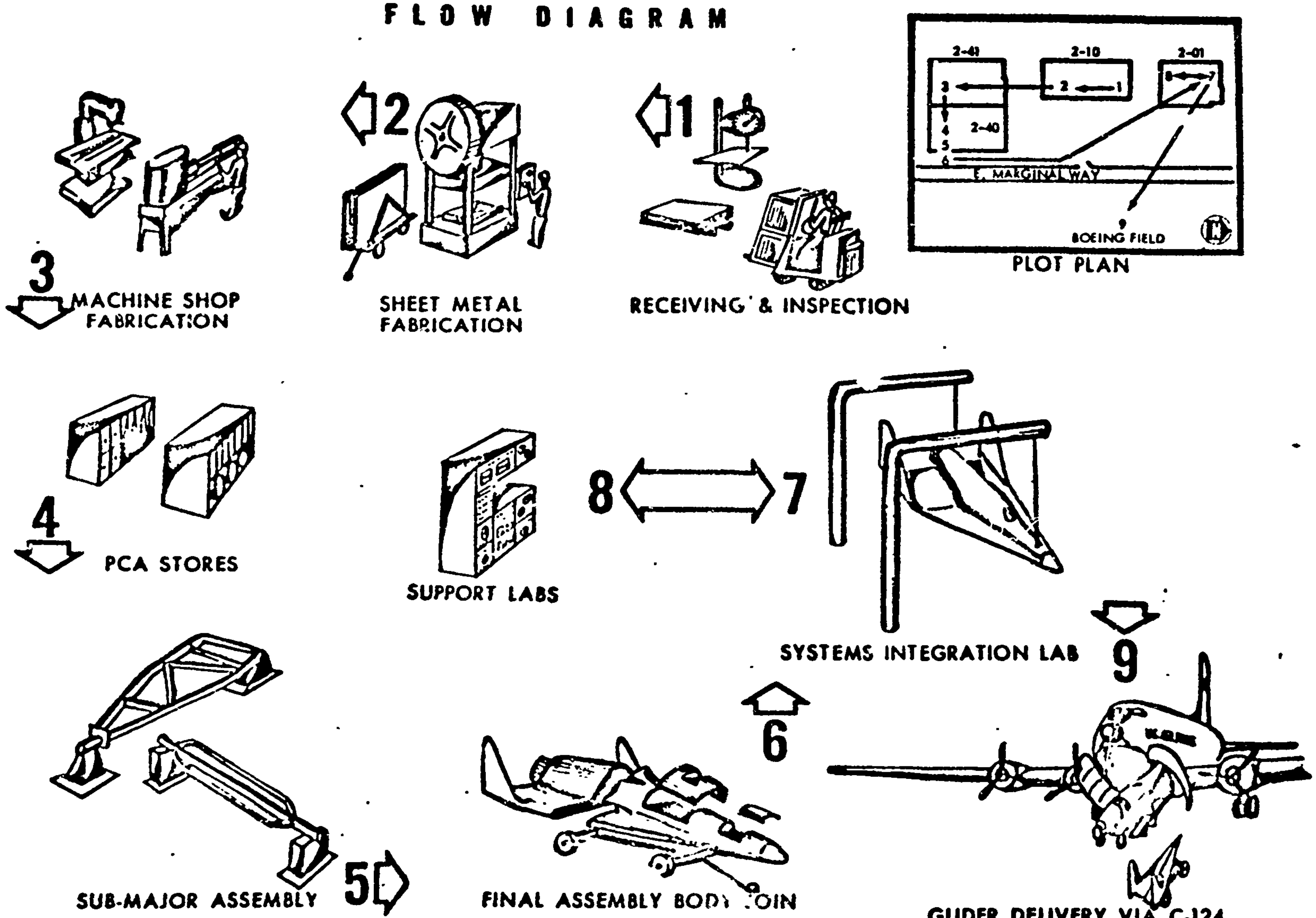



**PLOT PLAN - SEATTLE AREA COMPLEX**

BAC 1546 L-R3

~~CONFIDENTIAL~~

## CONFIDENTIAL
## FLOW DIAGRAM




CONFIDENTIAL

BAC 1346 L-R3



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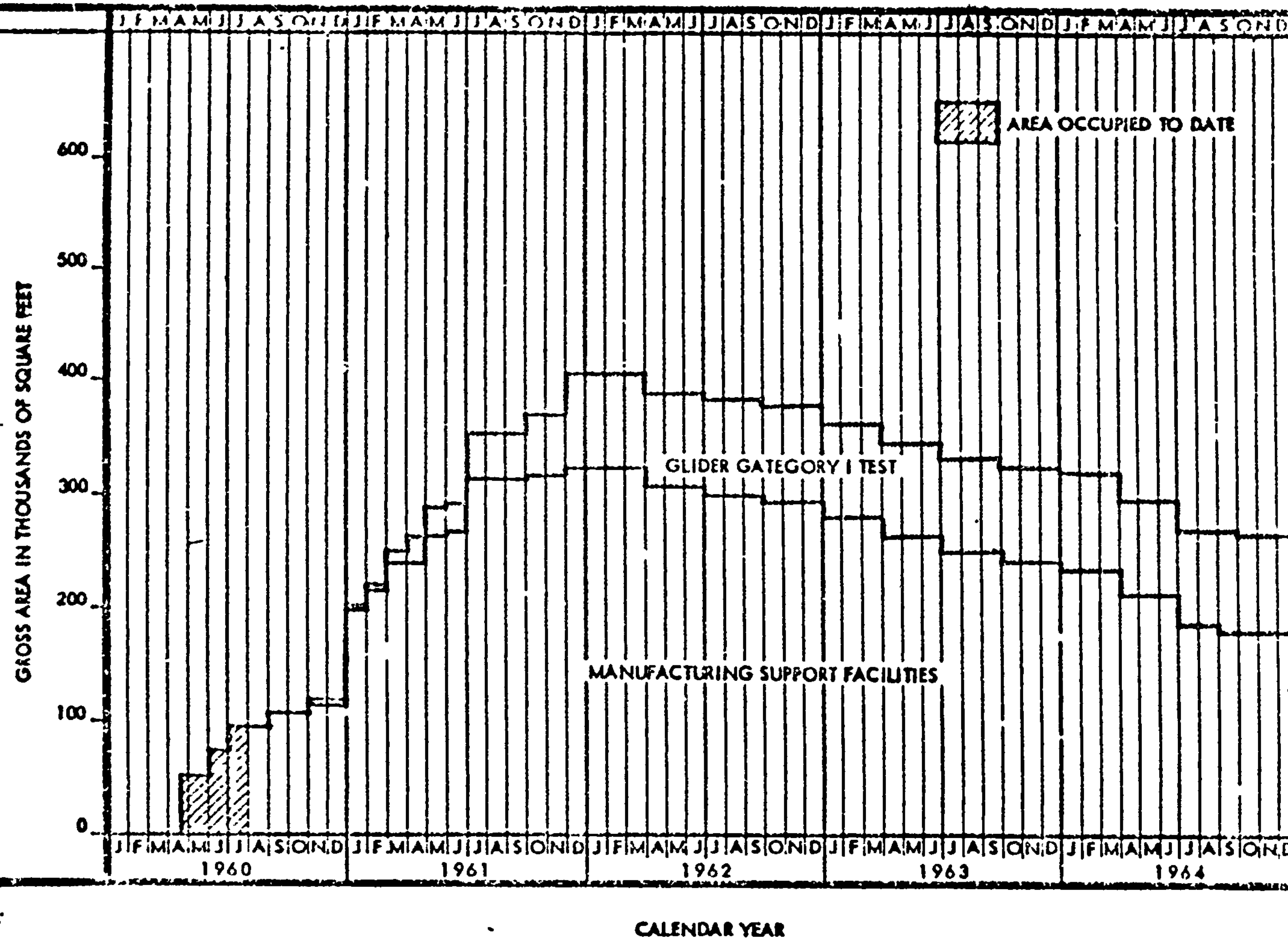
# GLIDER INDUSTRIAL AND CATEGORY 1 TEST FACILITIES

## SPACE FORECAST

SEATTLE AREA COMPLEX

AREA SUMMARY CHART

1. SUB-CONTRACTOR REQUIREMENTS TO BE DETERMINED.
2. ASSOCIATE CONTRACTOR REQUIREMENTS TO BE DETERMINED.
3. EXISTING MUTUAL SUPPORT AREAS ARE NOT INCLUDED.



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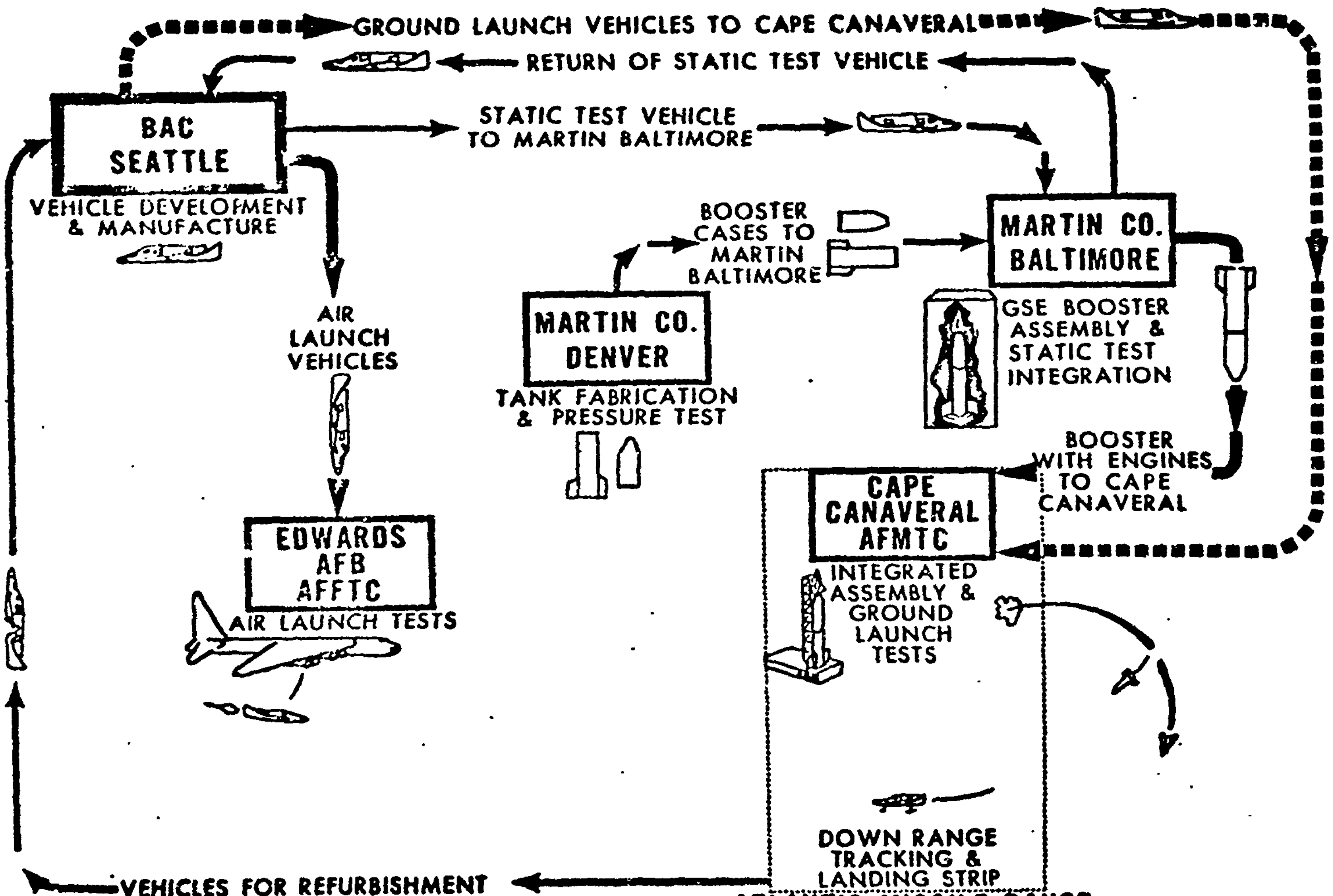
CONFIDENTIAL

MASTER FLOW DIAGRAM

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BOEING

NO. D2-5597



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~~CONFIDENTIAL~~

SUMMARY OF DESIGN DEVELOPMENT TEST PLAN

(D2-5697-16)

The Design Development Test Program planned by the System Contractor is presented herein in summary form. Development testing to be conducted by the Martin Co. as Associate Contractor to develop the booster is not included at this time. The test plan is divided into five major sections which are as follows:

a. Glider/System Design Development Tests
b. Glider Subsystems Design Development Tests
c. Glider/Booster System Design Development Tests
d. Ground Support Systems Design Development Tests
e. Free Flight Test Vehicle (HETS) Design Development Tests

Glider System Design Development Tests

(Ref. D2-5697-16, para. 3.1)

Testing in this area comprises all tests which relate to the design and development of the total glider system and are intended to establish the basic glider external configuration, shape and size of aerodynamic control surfaces, structural materials to be used, material design allowables, structural design environments, and establish allowable loads for the various structural components. These tests are grouped into the following technical areas:

a. Aerodynamic Heating (Ref. D2-5697-16, para. 3.1.1)
b. Performance Stability and Control (Ref. D2-5697-16, para. 3.1.2)
c. Materials and Processes (Ref. D2-5697-16, para. 3.1.3)

5

d. Basic Structural Allowables (Ref. D2-5697-16, para. 3.1.4)

e. Structural Environments Developmental Tests (Ref. D2-5697-16, para. 3.1.5)

f. Structural Components Allowables (Ref. D2-5697-16, para. 3.1.6)

Note: Detailed Wind Tunnel Test Plans have been compiled which cover the first nine months of the Step I Program; these plans are contained in BAC Document D2-5697, "Wind Tunnel Test Plans".

5

Glider Subsystems Design Development Tests

(Ref. D2-5697-16, para. 3.2.)

Testing in this area generally covers all glider subsystems which may be tested as separate entities and are not interrelated to other subsystems and their operating environments to such an extent that development testing of isolated subsystems cannot be conducted. Testing in this section which is not directed specifically at developing subsystem design criteria includes those tests which must be conducted to verify design adequacy and develop performance criteria prior to actual flight and/or qualification testing. The following major subsystems will be tested:

a. Structural Components (Ref. D2-5697-16, para. 3.2.1)

b. Landing Gear System (Ref. D2-5697-16, para. 3.2.2)

c. Deleted (Ref. D2-5697-16, para. 3.2.3)

5

d. Propulsion System (Ref. D2-5697-16, para. 3.2.4)

e. Glider Separation System (Ref. D2-5697-16, para. 3.2.5)

f. Escape System (Ref. D2-5697-16, para. 3.2.6)

g. Guidance System (Ref. D2-5697-16, para. 3.2.7)

h. Flight Control System (Ref. D2-5697-16, para. 3.2.8)

j. Communications (Ref. D2-5697-16, para. 3,2.9)

k. Secondary Power System (Ref. D2-5697-16, para. 3.2.10)

l. Environmental Control System (Ref. D2-5697-16, para. 3.2.11)

m. Crew Accommodations System (Ref. D2-5697-16, para. 3.2.12)

n. Test Data Acquisition System (Ref. D2-5697-16, para. 3.2.13)

Glider-Booster System Design Development Tests

(Ref. D2-5697-16, para. D2-5697-16, para. 3.3,)

Design development testing of the combined Glider/Booster is limited to those tests which are related to the design and performance of the total vehicle and are primarily intended to investigate the effects of the additions of the booster stabilizing fins, transition structure and glider vehicle to the basic booster assembly. The following test series are planned for this development area:

a. Aerodynamic Heating (Ref D2-5697-16, para. 3.3.1)

b. Performance, Stability and Control, (Ref. D2-5697-16, para. 3.3.2)

c. Guidance and Flight Controls (at present, all required testing in this area is covered by those tests planned for the glider vehicle; and special testing which may later become necessary will be added accordingly).

d. Structural Environments Developmental Tests (Ref. D2-5697-16, para 3.3.4)

Ground Systems Design Development Tests

(Ref. D2-5697-16, para 3.4,)

Testing in this area is limited to those tests necessary to establish initial design. Since the bulk of the ground support subsystems are developed from "state-of-the-art" components, the majority of the total testing required is covered by MIL-D-9412C which outlines the requirements for qualification and system suitability tests. Design development tests are planned for the following ground support subsystems;

a. Arresting Mechanism (Ref. D2-5697-16, para. 3.4.1)

b. Breathable Atmosphere Supply (Ref. D2-5697-16, para. 3.4.2)

c. RF Coupling Devices (Ref. D2-5697-16, para 3.4.3)

Free Flight Test Vehicle(HETS)

(Ref. D2-5697-16, para 3.5,)

Design development tests for the HETS test vehicle are primarily intended to develop aerodynamic and structural

c. Guidance and Flight Controls (at present, all required testing in this area is covered by those tests planned for the glider vehicle; and special testing which may later become necessary will be added accordingly).

d. Structural Environments Developmental Tests (Ref. D2-5697-16, para 3.3.4)

Ground Systems Design Development Tests

(Ref. D2-5697-16, para 3.4,)

Testing in this area is limited to those tests necessary to establish initial design. Since the bulk of the ground support subsystems are developed from "state-of-the-art" components, the majority of the total testing required is covered by MIL-D-9412C which outlines the requirements for qualification and system suitability tests. Design development tests are planned for the following ground support subsystems;

a. Arresting Mechanism (Ref. D2-5697-16, para. 3.4.1)

b. Breathable Atmosphere Supply (Ref. D2-5697-16, para. 3.4.2)

c. RF Coupling Devices (Ref. D2-5697-16, para 3.4.3)

Free Flight Test Vehicle(HETS)

(Ref. D2-5697-16, para 3.5,)

Design development tests for the HETS test vehicle are primarily intended to develop aerodynamic and structural design data for design of the third stage boost vehicle and Dyna Soar Structural Test Section which will be attached thereto. Additional testing is required to develop reliable temperature and pressure sensors which are compatible with the HETS flight environment. The following tests are planned to accomplish the above objectives:

a. Third Stage Aerodynamic Configuration Tests (Wind Tunnel Tests) (Ref. D2-5697-16, para. 3.5 and 3.5.1.1)

b. Structural Development Tests (Ref. D2-5697-16, para. 3.5.2)

c. Temperature Sensors Tests (Ref. D2-5697-16, para. 3.5.3)

d. Pressure Sensors Tests (Ref. D2-5697-16, para. 3.5.4)

## OUTLINE OF AIR CREW TRAINING PLAN

(D2-5697-17)

I FOREWORD

II DISTRIBUTION

III TABLE OF CONTENTS

IV SUMMARY

V DETAIL PLAN

GENERAL

Joint Coordinated Pilot Panel (Air Force - NASA - Contractor)

Qualifications.

B. ACADEMIC

1. Calculus and Differential Equations
2. Computer Theory
3. Astronautics
4. Astronomy
5. Aerodynamics and Aerothermodynamics
   a. Stability and Control
   b. Dynamics
6. Structures and Thermodynamics
7. Rocket Engines
8. Inertial Guidance
9. Life Sciences

C. SYSTEM FAMILIARIZATION (DESIGN DEVELOPMENT PARTICIPATION)

1. Document Distribution
2. Periodic Briefings
3. Design Coordination and Briefing
   a. Configurations
   b. Performance

6. SYSTEM FAMILIARIZATION (Continued)

3. c. Structures

d. Flight Controls

e. Crew Station

f. Escape

g. Auxiliary Power

h. Environmental Control

i. Electronics and Communications

j. Guidance

k. Booster

(1) Airframe

(2) Propulsion

(3) Control

4. Test Program Planning

5. Simulation

a. Fixed Base, 6° Flight Freedom

Proposed AFFTC Facility and

Contractor Developmental Simulator (includes some physiological stress capability)

b. Moving Base, 6° Flight Freedom

Roll Pitch Chair NASA Ames

c. Centrifuge

WADC, WADD and NASA Ames

d. System Integration Laboratory

Contractor

e. Reaction Control Simulator

Contractor

f. Supplemental Physiological

WADD

6. Wind Tunnel Test Observation

7. Qualification Test Observation

8. Mock-Up Evaluation

9. Manufacturing and Assembly Inspection

D. FLIGHT

1. Approach and Landing Simulations (60,000 ft., M-2)

| | | |
|---|---|---|
| F-106 | | AFFTC Trainers |
| F-106 | | Contractor Test Bed |

2. Maintain Flexible Reference (Including Instrument Proficiency)

| | | |
|---|---|---|
| T-33, F-100, T-38, F-104, F-105 | Aircraft of this type | AFFTC |
| B-52, KC-135 | High Inertia Vehicles (Boost) | AFFTC or Contractor |

3. Reaction Control

| | |
|---|---|
| F-104 | NASA Edwards |

4. Variable Stability

| | |
|---|---|
| T-33 | Cornell |
| F-100 | NASA Ames - Edwards |

5. Rocket

| | |
|---|---|
| X-15 | NASA - Edwards |

6. Zero Gravity

| | |
|---|---|
| F-100 | AFFTC |
| KC-135 | WADD |

7. Display Familiarization

| | |
|---|---|
| F-106 | Contractor Test Bed |

8. Suit and Human Instrumentation Familiarization

| | |
|---|---|
| TF-102 | AFFTC |
| F-106 | Contractor Test Bed |

9. Down Range Landing Site Familiarization

| | |
|---|---|
| F-106 | AFFTC |

10. Other Flight Investigations as Required

E. MISCELLANEOUS

1. Physical Training
2. Survival Training
3. Field Trips
   a. Range Familiarization
   b. ICBM and Mercury Launch Observations
   c. Subcontractor Coordination

## OUTLINE OF FIRE PROTECTION AND SAFETY PROGRAM PLAN

(D2-5697-18)

I. FOREWORD

II. DISTRIBUTION

III. TABLE OF CONTENTS

IV. SUMMARY

V. DETAIL FIRE PROTECTION & SAFETY PLAN

A. Organization

B. Flight Safety & Fire Protection

1. Design Analysis
2. Design Requirements
3. Design Criteria
4. Design Assurance
5. Test

C. Ground Safety & Fire Protection

1. Design Analysis
2. Design Requirements
3. Design Criteria
4. Design Assurance
5. Test

D. Associate Contractors Fire Protection & Safety Plan

1. Booster - Martin Company
2. Booster Engines - Aerojet General
3. Primary Inertial Guidance
4. Communications
5. Booster Guidance

E. Incident Reporting and Investigation

# SUMMARY

# OF

# HUMAN FACTORS PROGRAM PLAN

(D2-5697-19)

During the first increment of the Dyna Soar Step I program the Human Engineering effort will be coordinated closely with the Glider Design Section to up-date the previous analysis of the air crew functions and procedures essential to successful performance of the DS mission. The analysis on a relative time base will apply to both normal and emergency procedures during the pre-launch, launch to end of glide, and the re-entry through landing phases of the mission.

Human factors criteria and requirements will be revised to the new flight program analysis. A special effort will be made to determine the nature and timing of information required by the pilot and the control responses necessary for successful operation throughout the flight profile.

Aircrew physiological states and requirements will be assessed under the various conditions of the planned flights. Where necessary, to assist in evaluation of the environmental parameters, physiological studies of animal performance will be employed in ground tests and unmanned flights. Mans capabilities to function properly during flight performance under the physical and environmental parameters of the flight profile will be investigated further by studies on the NADC or equivalent simulator and by the use of operational ground and flight crew station mockups.

Continuing evaluation will be made of the protection and escape requirements and the protective equipment designed for the pilot.

After design requirements have been established a program of direct participation will be conducted with the design engineers to provide information needed to meet design trade-offs. A program of development tests will be conducted on prototype cockpit design by simulation of flight parameters.

Human factor requirements for physiological monitoring during flight and for launch and landing site facilities will be provided to the Systems Tests and Base Installation departments during the design and procuring phases of the program.

Human factor assistance will be provided for the development of the training program and for training equipment requirements.

During the flight phase of the test program on-site human factor personnel will collect data on the effect of cockpit design and protective personnel equipment for evaluation of the operator efficiency during the flight.

SUMMARY

OF

G. F. P. PLAN

NO. D2-5697-20

The "Dyna Soar Government Furnished Property (GFP) Plan Including GFAE Items" carries document No. D2-5697-20. This section is specifically the System Contractors' "GFP Plan". However, as the program develops and information becomes available, sections will be added covering 'Associate Contractor' "GFP Plans". Thus this summary will eventually include summary lists of GFP transferred among Associate Contractors and the System Contractor as well as GFP assigned by the Air Force for any of the Dyna Soar Contractors. Lists will be provided in this section when Contractual Agreements have been reached between the Government and the Dyna Soar Contractors. The items of Government Property which are listed in this document are covered by one or the other of the following definitions:

Government Furnished Property to the System Contractor (GFP) is defined as that type of property furnished by the Government which will not be on a bailment contract or facility contract, but will be accountable directly to Prime Contract AF 33(600)-41517 and normally will not be returned to the Government installed in a contract end-item. Final disposition of this property will be made at Air Force direction upon conclusion of the contract or when the purpose for which the property was obtained has been accomplished, whichever first occurs. It is anticipated that this type of property may be expended, used up during the course of contract performance, or tested to destruction, provided the Air Force has given its approval for such usage. This type of property is not to be confused with special tooling or ground support equipment. An example of GFP is Associate Contractor items for use in the Dyna Soar system mockup.

Government Furnished Aircraft Equipment (GFAE) is that property which is procured by the Air Force under the terms of a prime contract other than Dyna Soar Contract AF33(600)-41517 and is furnished direct to Boeing for inclusion or incorporation into the Dyna Soar Booster/Vehicle combination or otherwise incorporated in the end item and delivered to the Government with or installed in the end item. An example of GFAE is the AR2-3 rocket.

## GLOSSARY

### GENERAL

The following definitions of terms shall prevail throughout the Dyna Soar (Step I) Program.

### Air Vehicle

The air vehicle consists of booster, booster/glider transition, glider and all subsystems that become airborne immediately after launch.

### Bailment Property

Bailment Property is that property which can only be obtained from the Air Force through separate bailment agreements which are negotiated between the contractor and the Government, and which is necessary specifically for use in performance of a given contract. This property may not be expended or tested to destruction nor will it be installed and delivered to the Government in a contract end item. This property must be returned to the Government in the original condition in which it was received, less fair wear and tear, unless the bailment agreement authorizes modification of the property and permits its return to the Air Force in the modified form. Examples of Bailment Property are the test bed airplane and the pressure suits, helmets, etc., needed to fly it.

### Booster

The booster is the portion of the air vehicle that provides propulsive boost force to the glider and booster/glider transition and all subsystems thereof.

Booster/Glider Transition

The booster/glider transition is the structural tie that transmits the glider loads from the aft end of the glider to the booster. The transition also acts as a container for booster and glider equipment, part of which may be carried with the glider during orbital flight but jettisoned before re-entry.

Component

A functional part of a subsystem or equipment which is essential to operational completeness of the subsystem or equipment, and which may consist of a combination of parts, assemblies, accessories, and attachments. Examples are radio transmitter unit, radio receiver unit, amplifier unit. analyzer unit, computer unit, and control box.

Design Specifications

A design specification is one containing the data necessary to produce the item. This normally will include the details of material, composition, physical and chemical requirements, weight, size, dimensions, etc. In certain cases it is more feasible to incorporate design requirements in the form of drawings referenced in the specification. Design specifications establish the exact features of design to be used in the manufacture of a product in the same manner that a production drawing establishes the features and limitations. When other than over-all interchangeability is affected and it is necessary to specify the details of the design such as the interchangeability of minor component parts (so that the components of one manufacturer's product will be interchangeable with another's), the use of this method of presenting requirements may be utilized. The use of this method will depend upon the desirability of controlling the design in all respects.

Detail Specifications

A detail specification sets forth the requirements which must be met in order to furnish or produce the product whose characteristics are defined by the specification.

Facilities Equipment

Facilities is that equipment which can be used for general purposes (for example, other than Dyna Soar Contract) without functional modification. It must be (1) a capital type, having a continued use life of more than one year or an expense item having a life expectancy of less than one year and/or a unit cost of less than $100 and normally identifiable with a task rather than a specific end item or program; (2) recoverable at a nominal cost in the event modification is required; and (3) it can be a component of a major assembly or an item complete within itself.

Failure

A failure is any vehicle malfunction which requires removal of the vehicle from the launch pad, results in failure to land at the planned landing site, results in a loss of data significant enough to require re-running of the mission, or prevents normal recovery of the Payload and pilot from the glider.

Flight

A flight is considered to begin when the hold-down is released and ends after landing when the payload and the pilot have been removed from the glider.

Government Furnished Aircraft Equipment (GFAE)

Is that property which is procured by the Air Force under the terms of a prime contract other than Dyna Soar Contract AF33(600)-41517 and is furnished direct to Boeing for inclusion or incorporation into the Dyna Soar Booster/

Government Furnished Aircraft Equipment (GFAE) (Cont.)

Vehicle combination or otherwise incorporated in the end item and delivered to the Government with or installed in the end item. An example of GFAE is the AR2-3 rocket.

Government Furnished Property (GFP)

Is described as that type of property furnished by the Government which will not be on a bailment contract or facility contract, but will be accountable directly to Prime Contract AF33(600)-41517 and normally will not be made at Air Force direction upon conclusion of the contract or when the purpose for which the property was obtained has been accomplished, whichever first occurs. It is anticipated that this type of property may be expended, used up during the course of contract performance, or tested to destruction, provided the Air Force has given its approval for such usage. This type of property is not to be confused with special tooling or ground support Equipment. An example of GFP is associate contractor items for use in the Dyna Soar system mock-up.

General Specifications

General specifications cover requirements common to various products and services by including all such requirements pertaining to a series of different types, classes, grades, or styles in one specification in order to avoid repetition in related detail specifications and to permit rapid and economical changes in uniform common requirements. General specifications--

(a) Shall carry the words "General Specification For" as the closing phrase of the title;

(b) Shall contain the collective requirements applicable and common to the item(s) covered by the detail specification relating thereto; and, General Specifications (Cont.)

(e) Will be used for procurement only in conjunction with the detail specifications.

Glider

The glider is the winged portion of the air vehicle. The glider includes the portion of the air vehicle attached to the forward end of the booster/glider transition, and all subsystems thereof.

Ground Support Equipment

Ground Support Equipment is that equipment that directly supports operating and maintenance functions of launch and flight and includes that identical equipment used in prior operations but excluding special tooling and facilities.

Interface

An interface is a mating surface between two (2) parts, components, subsystems, etc., or any mode of contact between two (2) or more elements, including the human being during any operation of a system through either direct contact or any media such as visual, audio, power, etc.

Life Support

This term encompasses the entire areas of biological, physiological, and medical sciences which provide the basic data to define and establish the physiological criteria required to insure maximum pilot safety.

Maintainability

Maintainability consists of repairability and serviceability.

Maintenance

Maintenance is any action necessary for the retaining of materiel in, or

Maintenance (Cont.)

restoring it to, a serviceable condition, modifying or improving equipment, in use or in storage, to meet programmed operational requirements, installation-engineering and installation of fixed communications-electronic equipment and facilities. Maintenance also includes the function of servicing, trouble shooting, manufacturing, rebuilding, testing, reclaiming and the condition status classification.

Mission

A mission is defined as the prelaunch checkout, countdown, subsequent flight and recovery of the crew and test data.

Payload

Payload shall be defined as military test, or scientific equipment, instrumentation, recording and telemetry apparatus necessary to detect or sense, record and transmit in-flight system performance and scientific data. The following items shall be considered as payload.

(a) Wiring, plugs, receptacles, antennae, antenna leads, tubing, fittings, ducting, etc., and any other electrical, electronic, hydraulic, or mechanical equipments provided for the sole purpose of accommodating payload items.

(b) Special temperature limiting or pressurizing apparatus provided for the sole purpose of accommodating remotely located payload type instrumentation, wiring, etc.

(c) Immediate support brackets, shock mounts, and racks peculiar to the payload items.

(d) Any provisions for payload in excess of the quantities noted in Paragraphs (4) (i) through (4) (iv) below.

Payload (Cont.)

(e) The following items shall be included in the basic vehicle weight and shall not be considered as payload.

(1) Instrumentation, recording, and telemetry apparatus required for vehicle safety and control.

(2) Basic structural provisions required to carry the defined payload weight in the basic container or containers located within the glider body, and including the weight of the containers. In addition, an allowance of 40 pounds will be made for structural modifications (such as cutout reinforcements in the container or glider external surfaces) peculiar to specific payload installation requirements.

(3) The provisions for supplying for payload use a peak electrical output of 2 kilowatts (including 350 watts DC) of the same quality of power as is supplied to the basic vehicle and an average power of one Kilowatt for the flight duration.

(4) Payload and basic equipment compartment(s) cooling and pressurization equipment and provision sufficient to cover:

(i) The power allotment described in paragraph (h) above.

(ii) Aerodynamic heating rates resulting from installation of payload items, not to exceed 8000 BTU/hr. and total aerodynamic heat inputs not to exceed 8000 BTU over and above that required for the normally insulated compartment configuration.

(iii) Leakage rates not to exceed .25 pounds per minute for the total basic equipment plus payload equipment installation within the equipment compartment. Leakage rates in excess of .25 pounds per minute resulting from changes

Payload (Cont.)

made to the basic equipment compartment to accomodate payload or additional pressurized compartments which must be added to accommodate payload will be chargeable to payload.

(iv) Payload conditioning requirements which are not more stringent than those for the basic glider equipment.

(5) Ballast (if necessary).

(6) Structural provisions resulting from 100 per cent heat blockage of the lower surface underneath the body.

(7) For the purposes of Air Vehicle Weight Control, it is requested that MIL-W-25140 and MIL-W-3947 be used in lieu of the above definition.

Performance Specifications

Performance specifications are specifications which express requirements in the form of output, function, or operation of items or equipments leaving the details of design, fabrication, and internal workings to the producer's option. This type of specification should cover required performance rather than optimum performance and ordinarily is prepared when specification of design is not essential. (Also includes essential interface characteristics.)

Prelaunch, Checkout, and Countdown

Prelaunch, checkout, and countdown is considered to begin at the time the vehicle is fully assembled upon the pad and ends when the hold-down is released.

Reliability

Reliability is the probability of mission completion without failure, or out-of-limits equipment operation.

## Repairability

Repairability is the probability that when maintenance action due to equipment malfunction is taken, the system will be restored to a satisfactory operating condition in a given period of time with a given manpower expenditure and the probability that the equipment will remain in satisfactory operating condition for a specified period of time.

## Safety

Safety is the ability of the system to return the crew without major injuries once the crew enters the glider.

## Serviceability

Requirements to be met by equipment, design, configuration, installation, and operation that will minimize maintenance requirements including the use of special tools, support equipment skills, manpower, and enhance the ease of performance of maintenance, including repair, inspection and servicing with expenditure of time and material in its planned environment.

## Specification

A specification is a clear and accurate description of the technical requirements for a material, a product, or service, including the procedure by which it can be determined that the requirements have been met. The scope of this definition embraces documents used in invitation for bids, proposals, and contracts. These documents describe and establish the technical and physical characteristics or performance requirements of specific materials, products, or services, including the packaging and packing, marking or other essential characteristics or requirements, together with the prescribed methods of inspection and testing for determining that these requirements are met by suppliers. When qualification approval is required, specification shall in-

Specification (Cont'd)

clude appropriate qualification tests. (From Standardization Manual M205 dated 9 April 1958)

Special Tooling

Special Tooling is that equipment manufactured, modified or purchased solely for the manufacture, test, handling, or transportation (except that concerned with launch and recovery) of the parts assemblies and equipment, and not useable on other contracts or classified as Ground Support Equipment.

Subsystem

A major functional part of a weapon system, usually consisting of several components, which is essential to operational completeness of the weapon system. Examples are airframe, propulsion, guidance, navigation, and communication.

System Human Engineering

Is defined, for the purposes of the Step I program, as determination of man's capabilities, limitations, and performance as they relate to the equipment and procedures he will use in the system and the application of this determination to the planning, design, and testing of the system.

Type I Data

Type I reports and data are those requiring USAF approval.

Type II Data

Type II reports and data are those required for surveillance and informational purposes.